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COMBINED CATALOGS



Northeastern University

COLLEGE OF LIBERAL ARTS

COLLEGE OF EDUCATION

COLLEGE OF BUSINESS ADMINISTRATION

COLLEGE OF ENGINEERING

COLLEGE OF PHARMACY

COLLEGE OF NURSING

BOSTON-BOUVÉ COLLEGE

COLLEGE OF CRIMINAL JUSTICE

UNIVERSITY COLLEGE

LINCOLN COLLEGE

GRADUATE SCHOOLS

of

Arts and Sciences

Business Administration

Education

Engineering



NORTHEASTERN
UNIVERSITY

1968-1969

undergraduate
catalog

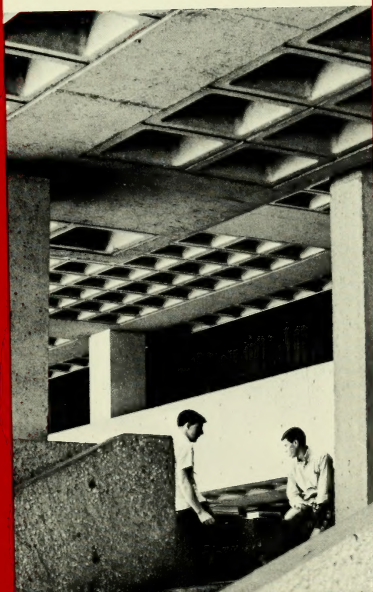




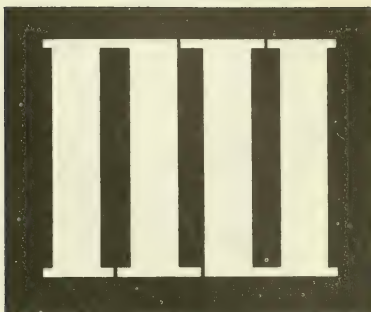
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The New England Association of Colleges and Secondary Schools accredits schools and colleges in the six New England states. Membership in one of the six regional accrediting associations in the United States indicates that the school or college has been carefully evaluated and found to meet standards agreed upon by qualified educators. Colleges support the efforts of public school and community officials to have their secondary schools meet the standards of membership.



**NORTHEASTERN
UNIVERSITY**

1968-1969

**undergraduate
catalog**

**BOSTON-BOUVÉ
BUSINESS ADMINISTRATION
CRIMINAL JUSTICE
EDUCATION
ENGINEERING
LIBERAL ARTS
NURSING
PHARMACY**

**NORTHEASTERN UNIVERSITY
360 HUNTINGTON AVENUE
BOSTON, MASSACHUSETTS 02115**



ACADEMIC CALENDAR FOR BASIC COLLEGES 1968-1969

September 10 (Tuesday)	Freshman Registration—Beginning of Orientation Period
September 16 (Monday)	Upper-Class Registration—Beginning of Fall Quarter for Division B Students and Freshmen—Changeover Date—Beginning of Fall Quarter Co-op Term
<i>No Classes</i> on the following holidays during the Fall Quarter	
	November 11 (Monday)
	November 28 and 29 (Thursday and Friday)
November 25-27, December 2-3	Final Examination Period for Fall Quarter
December 4-6 (Wednesday-Friday)	No examinations scheduled
December 9 (Monday)	Registration—Beginning of Winter Quarter for Division A Students and Freshmen—Changeover Date—Beginning of Winter Quarter Co-op Term
December 23— January 1, 1969 (Monday-Wednesday)	Christmas Vacation—No Classes
February 17 (Monday)	Holiday—No Classes
March 3-7 (Monday-Friday)	Final Examination Period for Winter Quarter
March 10-14 (Monday-Friday)	Vacation for Freshmen and Division A Students
March 17 (Monday)	Registration—Beginning of Spring Quarter for Division B Students and Freshmen—Changeover Date—Beginning of Spring Quarter Co-op Term
April 21 (Monday)	Holiday—No Classes
May 26 (Monday)	Holiday—No Classes
June 2-6 (Monday-Friday)	Final Examination Period for Spring Quarter
June 9-13 (Monday-Friday)	Vacation for Division B Students
June 15 (Sunday)	Commencement
June 16 (Monday)	Registration—Beginning of Summer Quarter for Division A Students and Freshmen in Summer Quarter—Changeover Date—Beginning of Summer Quarter Co-op Term
July 4 (Friday)	Holiday—No Classes
August 28 (Thursday)	No Classes
August 29 — September 5 (Friday-Friday)	Final Examination Period for Summer Quarter
September 1 (Monday)	Holiday—No Classes
September 8-12 (Monday-Friday)	Vacation for Division A Students

ACADEMIC CALENDAR (cont.)

September 9 (Tuesday)	Freshman Registration (Class of 1974)—Beginning of Orientation Period
September 15 (Monday)	Upper-Class Registration for Fall Quarter (Division A)

Note: No Classes on Registration Days



Office Hours

INTERVIEW PERIODS

Monday through Friday 9:00 A.M. - 4:00 P.M.
Saturdays (by appointment) 9:00 A.M. - 11:30 A.M.

Guided tours of the University are scheduled on weekdays by request.

The office is closed on all legal holidays.
Requests for catalogs and information should be addressed to

THE DEAN OF ADMISSIONS
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Boston, Massachusetts 02115

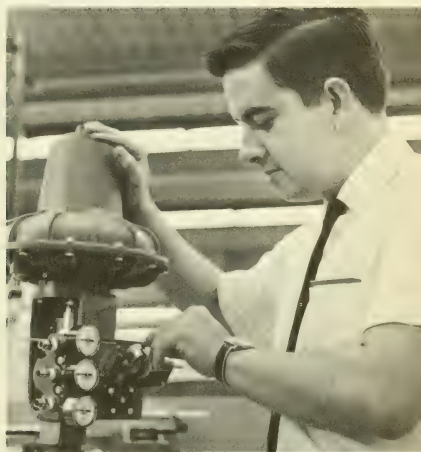
Office: 150 Richards Hall

Tel. 437-2200





*A
Pictorial
Visit*



LEGEND

- 1 School of Law (104 The Fenway)
- 1A School of Education (102 The Fenway)
- 2 Melvin Hall
- 3 Smith Hall
- 4 115-119 Hemenway Street
- 5 White Hall
- 6 Stetson Hall
- 7 Speare Hall
- 8 106-122 St. Stephens Street
- 9 Light Hall
- 10 Parker Building
- 11 Greenleaf Building
- 12 Cabot Physical Education Center
- 13 Richards Hall
- 14 Dodge Library
- 15 United Realty Building
- 15A Center for Continuing Education (40 Leon Street)
- 16 Forsyth Building
- 17 Forsyth Annex
- 18 Charles A. Dana Research Center
- 19 Churchill Hall (formerly Graduate Center)
- 20 Hayden Hall
- 21 Eli Student Center (new)
- 21A Eli Student Center (original)
- 22 Mugar Life Sciences Building
- 23 Robinson Hall
- 24 Botolph Building
- 25 Chemistry Building
- 26 Boston-Bouvé
- 27 Swimming Pool and Handball Court
- 28 School of Law and Criminal Justice (under construction)



PLAN OF
NORTHEASTERN UNIVERSITY
BOSTON, MASSACHUSETTS





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Historical Statement

Founded in 1898, Northeastern University is incorporated as a privately endowed nonsectarian institution of higher learning under the General Laws of Massachusetts. The State Legislature by special enactment has given the University general degree-granting powers. The University is governed by a Board of Trustees who are elected by and from the Northeastern University Corporation, which is composed of more than 150 distinguished business and professional men.

From its beginning Northeastern University has had as its dominant purpose the discovery of community educational needs and the meeting of these in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has sought to pioneer new areas of educational service.

A distinctive feature of Northeastern University is its Cooperative Plan, initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922), Liberal Arts (1935), Education (1953), Pharmacy (1962), Nursing (1964), Boston-Bouv  College (1964), and the College of Criminal Justice (1967). This time-tested educational method enables students to gain valuable practical experience as an integral part of their college programs and also provides the means by which they may contribute substantially to the financing of their education. The Plan has been extended to the graduate level in engineering, mathematics, sociology, actuarial science, the pharmaceutical sciences, professional accounting, and business administration.

In the field of adult education, Northeastern University offers graduate and undergraduate degree programs and non-credit programs which are specifically designed to meet the needs and interests of adults who wish to further their education on a part-time basis.

All formal courses of study leading to degrees in the Graduate Division, Lincoln College, and University College are approved by the undergraduate faculties concerned, and are governed by the same qualitative and quantitative standards as the regular day curricula. Courses are scheduled in the day and evening at the Boston Campus, Suburban Campus in Burlington, and at other off-campus locations near Boston.

Other Schools and Colleges of the University

LINCOLN COLLEGE

Lincoln College offers part-time evening programs leading to associate and/or bachelor's degrees in Allied-Medical Technology, Civil Engineering Technology, Electrical Engineering Technology, Industrial Technology, Mechanical Engineering Technology, and Science Technology. Additional programs in industrial, science, and allied-medical technology, leading to the Bachelor of Science degree, are offered in collaboration with University College.

UNIVERSITY COLLEGE

University College, so called because it draws upon the resources of the other colleges of the University, offers part-time evening programs in Liberal Arts, Business Administration, Law Enforcement and Security, and Health Care Administration, leading to the Associate in Science and Bachelor of Science degrees. Special-program certificates may also be earned, and workshops and seminars are offered for degree credit.

University College does not duplicate the offerings of the day colleges, but provides curricula which cut across traditional subject-matter areas to meet the particular needs of adult students who may be employed full-time or enrolled full time in professional schools affiliated with Northeastern University.

University College and Lincoln College offer a joint program in Medical Technology conducted in affiliation with a number of hospital schools of medical technology approved by the American Medical Association. Students receive a Bachelor of Science degree from University College, and they may write the examination for certification as a registered medical technologist (ASCP).

Students may enroll as degree candidates or elect single courses appropriate to their needs and interests. Courses are scheduled in the day and evening at the Boston Campus, Suburban Campus in Burlington, and other off-campus locations near Boston.

Day programs for adults, under the direction of University College, were developed to meet the needs of adults with family or other obligations who wish to engage in part-time study during the day. Non-credit courses and undergraduate and graduate degree programs are offered at the Boston and Burlington campuses. Included are courses from the Graduate School of Education, the Graduate School of Arts and Sciences, University College, and the Center for Continuing Education. A human Relations and Adult Counseling Program is also offered.

CENTER FOR CONTINUING EDUCATION

The Center for Continuing Education was established to relate the University to the needs of its community in a period of accelerated change. Its programs are composed of seminars, conferences, institutes, forums, and a wide variety of special courses designed to serve specific needs. The Division of Special Programs, working cooperatively with trade associations and professional societies, offers a wide variety of programs dealing with current needs and problems. Through its Division of Community Services, working with governmental agencies and community organizations, the Center is becoming increasingly involved in social problems on both the local and national level.

Many of these programs are conducted at Henderson House, Northeastern University's conference center in Weston, Massachusetts.

FACULTY

Marvin S. Arffa, A.B., M.S., Ed.D.
Associate Professor

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Instructor, Medical Laboratory

Patrick S. Walsh, B.S.
Instructor

Clifford F. Youse, B.A., B.S., M.B.A.
Assistant Professor

GRADUATE DIVISION

The Graduate Division of the University offers day and evening programs. It is made up of the following Graduate Schools, which offer programs leading to the degrees listed:

ACTUARIAL SCIENCE

Master of Science in Actuarial Science.

ARTS AND SCIENCES

Master of Arts, Master of Science; Ph.D. in Biology, Chemistry, Mathematics, Physics, Psychology and Sociology.

BUSINESS ADMINISTRATION

Master of Business Administration.

EDUCATION

Master of Education.

ENGINEERING

Master of Science with course specification, including a special six-year program in Power Systems Engineering leading to both bachelor's and master's degrees in Electrical Engineering; a similar six-year program in Mechanical Engineering leading to both bachelor's and master's degrees; and Ph.D. in the fields of Electrical, Chemical, and Mechanical Engineering.

PHARMACEUTICAL SCIENCES

Master of Science with specialization in Hospital Pharmacy, Industrial Pharmacy, Medicinal Chemistry, and Pharmacology.

PROFESSIONAL ACCOUNTING

A five-quarter curriculum leading to the degree of Master of Science in Accounting.

Some of these programs are offered on the Cooperative Plan; others provide teaching and research fellowships for able candidates.

SCHOOL OF LAW

The School of Law offers a full-time program of professional instruction leading to the degree of Doctor of Law (J.D.). The curriculum covers four years, which includes fifteen months of experience in law offices. There are no courses for part-time or evening students.

The program is directed toward preparing students for the practice of law in any state of the nation. The curriculum has a highly contemporary orientation. Extensive use is made of the Boston metropolitan area to add realism to the academic program, especially concerning the legal problems of an urban society.

RESEARCH ACTIVITIES

The faculties of the University are engaged in a wide variety of basic research projects in business, science, social science, pharmacy, and engineering. These are coordinated by the Dean of Research, whose services are University-wide and available to the faculties of all the Colleges.

Although Northeastern is primarily concerned with undergraduate and graduate instruction, the University believes that the most effective teaching and learning takes place in an environment characterized by research activities directed toward extending the frontiers of knowledge.



Buildings and Facilities

The main campus of Northeastern University is located on Huntington Avenue in the Back Bay section of Boston, near the Fenway.

Many of Boston's famous cultural, educational, and philanthropic institutions are situated in the Back Bay, including the Museum of Fine Arts, Symphony Hall, Horticultural Hall, The Isabella Stewart Gardner Museum, the Harvard Teaching Hospitals, and many schools and colleges both public and private.

Northeastern University's 47-acre campus is divided by Huntington Avenue, with the educational buildings on the south side and dormitories on the north.

The main educational buildings, all of which have been completed since 1938, are of glazed-brick construction in the contemporary classic style. Most are interconnected with closed passageways so that students and faculty may move from building to building under shelter during the winter months.

Richards Hall, built in 1938, houses the main administrative offices of the University, contains some of the Mechanical Engineering laboratories and provides a number of classrooms and faculty offices.

The Mugar Life Sciences Building contains the College of Pharmacy and the Departments of Psychology, Biology, and Chemical Engineering.

Centrally located where it is readily accessible to students from all of the Colleges and the Graduate Division is the Dodge Library, operated upon an open-stack plan and equipped to serve effectively the needs of the varied student bodies which comprise the Northeastern community. The Dodge Library is an official depository for government publications and documents.

The Carl S. Ell Student Center provides facilities for student recreation and for extracurricular activities. The Alumni Auditorium, with a seating capacity of 1,300, is part of this building. Also included are special drama facilities, a ballroom, a main lounge, fine arts areas, student offices, conference rooms, meeting areas, and a student dining area seating more than 1,000 persons.

Hayden Hall provides the principal facilities of the College of Business Administration and the College of Liberal Arts. Its ground floor is occupied by the Department of Electrical Engineering. Headquarters of University College and Lincoln College, and the office of the University Registrar, are also located in Hayden Hall.

Churchill Hall contains the administrative headquarters of the Graduate Division, houses the Departments of Earth Sciences and Philosophy, and also includes the faculty and staff cafeteria.

The Godfrey Lowell Cabot Physical Education Center is one of the best equipped in New England. It contains four basketball courts, an athletic cage, a women's gymnasium, and a rifle range, as well as administrative offices for the Department of Athletics and for the Physical Education Department of Boston-Bouvé College.

Mary Gass Robinson Hall contains the offices of the College of Nursing; nursing, biology, and physical therapy laboratories; radio and TV facilities; lecture rooms; and classrooms.

A discussion takes place outside the Student Center.



The United Realty Building is the location of the offices of the Departments of Mathematics, Economics, Journalism, Sociology, and Industrial Engineering and research facilities for Biology, Chemistry, Psychology, and Mechanical Engineering.

The Dana Research Center houses research facilities for Physics and Electrical Engineering.

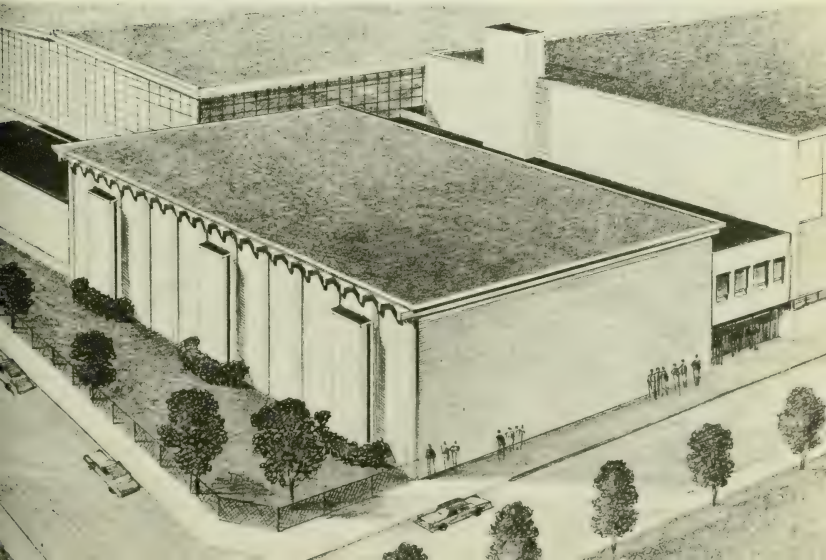
Three other buildings on the campus have been completely remodeled and reconditioned for educational purposes. These are the Botolph Building, which houses the Department of Civil Engineering; the Forsyth Building, in which are located the University Health Service, the planetarium and some of the Mechanical Engineering laboratories, and the Greenleaf Building, now used for research and for offices of the Department of Military Science.

New Facilities

Two new physical education facilities have been constructed on the Boston Campus. A five-story structure houses Boston-Bouvé administrative offices, classrooms, laboratories, and faculty offices, as well as a library, dance studio, and gymnasium.

An addition to the Cabot Center contains a 105-foot swimming pool for instruction and intercollegiate competition, a practice tank for the rowing team, a weight room, handball courts, and shower and dressing facilities.

Architect's drawing of building which houses a swimming pool, handball courts, and practice tank for the crew.



20 / BUILDINGS AND FACILITIES

A \$3,000,000 chemistry building contains classrooms and laboratories for undergraduates as well as special research facilities for graduate students and faculty. It also houses the departmental library as well as lecture halls and offices.

In July of 1968 ground was broken for a building which will house the School of Law and provide headquarters for the College of Criminal Justice.

The new Dana Research Center, which provides facilities for research in Physics and Electrical Engineering.



Dormitories

Dormitory facilities accommodate 2400 undergraduate students—925 men and 1475 women. The facilities for men consist of four dormitories; White Hall—the largest men's dormitory—houses 393 residents, Melvin Hall (145), 153 Hemenway Street (127), and 115–119 Hemenway Street (260 residents). Women reside in Speare Hall (404), Stetson Hall (825), Smith Hall (197), and Light Hall (50).

All of the dormitories contain lounges for relaxation, study rooms, laundry facilities and television rooms. Four large dining rooms are located in the dormitories where residents take their meals.

In addition to the foregoing, there is an apartment house complex which is capable of housing 287 students. This facility is used for upperclass male students.

None of the facilities are more than a five-minute walk to the classroom.

Stetson Hall, one of the newest residence halls for women students.



PARKING

Adjacent to the campus are parking areas for 2,400 automobiles.

Off-Campus Facilities

Northeastern University operates one of the nation's finest off-campus centers for continuing education at Henderson House in Weston, Massachusetts, which is 12 miles from the main campus on Huntington Avenue.

The University conducts some of its courses at a Suburban Campus near Route 128 in Burlington, Massachusetts, and Northeastern's Center for Management Development uses facilities on the campus of Phillips Academy in Andover, Massachusetts.

Athletic facilities for football and baseball are located at Kent Field, Kent Street, Brookline.

One of the University's most beautiful off-campus properties is the Warren Center for Physical Education and Recreation Education in Ashland, Massachusetts. Located on the 200-acre site is a large balconied lodge and six woodland cottages. At various times during their academic program, Boston-Bouvé students will live at the Center to gain practical experience in camp leadership and outdoor education.

Northeastern has recently established a Marine Science Institute as a research and instructional facility primarily engaged in studies of Marine Biology and Oceanography. The Institute, operated year round, is located on East Point, Nahant, which is situated about 20 miles northeast of Boston on a promontory jutting out into Boston Harbor.

Suburban Campus—Burlington, Mass.



General Information

Policy on Changes of Program

The University reserves the right to withdraw, modify, or add to the courses offered or to change the order or content of courses in any curriculum.

The University further reserves the right to change the requirements for graduation, tuition, and fees charged, and other regulations. However, no change in tuition and fees at any time shall become effective until the school year following that in which it is announced.

Any changes which may be made from time to time pursuant to the above policy shall be applicable to all students in the school, college, or department concerned, included former students who may re-enroll.

Textbooks and Supplies

The Northeastern University Bookstore, located on the ground floor of the Ell Student Center, is a department of the University and is operated for the convenience of the student body. All books and supplies which are required by the students for their work in the University may be purchased at the Bookstore.

Physical Education Requirements

The basic physical education requirement includes successful completion of two one-credit courses in physical education. Each course carries one quarter hour of degree credit.

Exemption from this basic requirement is granted when:

1. The University physician advises it.
2. A student has completed the two-year course in ROTC or the equivalent in prior active military service.
3. Transfer credit has been approved by the Dean of the College.
4. A student has been a member of an intercollegiate sports squad for two full seasons (men).

Part-Time Work

Students who find it necessary to accept part-time jobs while attending college may obtain such work through the Office of Financial Aid.

Students are not justified in assuming that the University will take care of their expenses or guarantee to supply them with work sufficient to meet all their needs.

24 / GENERAL INFORMATION

A student should have funds adequate to meet the expenses of the freshman year. They should amount to at least the first year's tuition plus books and supplies, and room and board for 36 weeks.

The Academic Year

The academic year at Northeastern is divided into four quarters of thirteen weeks each. Classroom instruction is over a twelve-week period including a week of final examinations. The thirteenth week is a week of vacation for the students completing the preceding quarter of classes. There is a modification of this plan in the fall quarter to allow for a Christmas holiday. The period of cooperative work is the full thirteen-week quarter.

Quarter Hour Credits

All courses are evaluated in terms of quarter hour credit. A quarter hour credit is equal to three-fourths of a semester hour credit.

GRADES AND EXAMINATIONS

Examinations

Examinations covering the work of the quarter are usually held at the close of each quarter. Exceptions may be made in certain courses where, in the opinion of the instructor, and with the approval of the Dean of the College concerned, final examinations are not necessary.

Special Final Examinations

Students who have received permission to make up missed final examinations will be charged a single fee of \$5 covering all of the examinations missed within one final examination period during a given period of illness.

Grades

A student's grade is officially recorded by letter. Following is a listing of grades with their numerical equivalents:

	Numerical Equivalents
A Outstanding Attainment	4.0
B Good Attainment	3.0
C Satisfactory Attainment	2.0
D Poor Attainment	1.0
F Failure	0.0
I Incomplete	
WF Withdrew from Course—Failing	

A general average of D is not acceptable and will not allow a student to continue at Northeastern University.

Freshman students who are taking a full academic program and who have a weighted average for the year below 1.4 will not be permitted to register for advanced work. Upper-class students should consult the Student Handbook to ascertain the level of continuing achievement required of them by the faculty of their college.

An I, or Incomplete, grade is used for a temporary grade to show that the student has not taken the final examination in the course.

Dean's List

A Dean's List, issued at the end of each quarter, contains the names of upper-class students who have a 3.0 weighted average in all subjects with no grade below C during the preceding period. Freshmen who meet the same standards in their work are included on a Freshman Honor List. No student subject to disciplinary action is eligible for either list.

Reports on Scholastic Standing

Reports for all students are issued at the end of each grading period. Questions relative to grades are to be discussed with the student's faculty adviser.

At the end of each academic year, the student will receive in addition to his term report a complete cumulative copy of his permanent record.

Students are constantly encouraged to maintain an acceptable quality of college work. Parents and students are always welcomed by the college officers and faculty advisers for conference upon such matters.

Parents or guardians will be notified whenever students are advised or required to withdraw from the University. If parents so request, report cards will be sent to them instead of the student.

Selective Service Deferment

Students who wish to be deferred by Selective Service must make such request personally to their draft boards by filing SSS Form 104 once each year. The University will furnish local draft boards of verification of the student's attendance only at the written request of the student. All students are furnished the necessary forms to file for deferment with their fall registration material. Students who begin the academic year with their term of cooperative work will receive these forms at the same time by mail. Because of the cooperative plan, the academic year at Northeastern University runs from September to September.

GENERAL CONDUCT

It is assumed that students come to the University for a serious purpose and that they will conform to such regulations as may from time to time be made. The University community expects each student to respect the rights and privileges of others and to adhere to acceptable standards of personal conduct. Students should exercise their freedom with maturity and responsibility. Students are expected to obey the regulations of the University; to follow the instructions of and pay due respect to University officials. Conduct inconsistent with the general order of the University may result in disciplinary action. Damage to any building or to any of the furniture, apparatus, or other property of the University, will be charged to the student or students known to be immediately involved.

It is desired to administer the discipline of the University so as to maintain a high standard of integrity and a scrupulous regard for truth. The attempt of any student to present any work which is not his or her own, or to pass any examination by improper means, is regarded as a most serious offense and renders the offender liable to disciplinary action. The aiding and abetting of a student in any dishonesty is also held to be a grave breach of discipline.

Attendance

Students are expected to attend all scheduled meetings of their classes.

Absence from regularly scheduled classes in any subject may seriously affect the standing of the student. It may cause the removal of the subject or subjects from the student's schedule.

Laboratory work can be made up only when it is possible to do so during hours of regularly scheduled instruction.

Attendance at all convocations of the student body is compulsory. Exceptions to this rule are made only when the student has received permission from the Director of Student Activities previous to the meeting in question.

Attendance at Commencement

All candidates for a first degree (bachelor or associate) are required to attend Commencement in the year of qualification. First degrees in absentia are awarded only to candidates excused for personal or immediate-family illness, military service, or employment obligations beyond the control of the candidate.

A petition to receive a degree in absentia must be presented to the Dean of the College in which the candidate qualifies. Each petition will be acted upon by the academic Dean involved, the candidate having the privilege of appeal to the Vice President for Academic Affairs.

STUDENT HOUSING

The University maintains residence halls on the Boston campus for both men and women. These facilities can accommodate a large portion of the men students and all of the women students who live away from home.

Women's Residence Regulations

Unmarried women students under age 21 who do not live with their parents or a legal guardian are required to live in a University residence hall both while attending classes and while on cooperative work assignment. If a student's cooperative work assignment is not in her home town and if it is not within commuting distance of a University residence hall, special arrangements are made through the Department of Cooperative Education, with the written approval of her parents. Commuting students who wish to live elsewhere than home are also subject to the University's residence requirements. Students in unauthorized housing are subject to disciplinary action. Questions regarding these regulations must be directed to the Dean of Women.

The University dormitories for women are staffed by Residence Directors and upperclassmen who serve as Dormitory Counselors. Complete facilities are available for living, study and dining. Subscription to the meal plan (3 meals a day, 21 meals a week) is required unless a student is in her cooperative work period, at which time it is optional. Additional information regarding the women's residences and applications for rooms may be obtained from the Dean of Admissions.

Freshman Men's Residences

The University provides living accommodations in its dormitories for all freshmen under the age of 21 living away from home. The cost is \$396 for each 12-week quarter, payable at the beginning of the term, and includes three meals each day. Applications for housing may be filed with the Department of Admissions after a student has been accepted. A dormitory deposit of \$100 must accompany the application for housing. The student's receipt of this \$100 deposit from the University is his guarantee of a room in the dormitory. (This deposit is non-refundable and will be applied against the first term's board-and-room charges.) Definite notice of room reservations will be sent by the Director of University Housing in the late summer.

Students should write to the Dean of Admissions for further information and for the Application for Residence.

Apartments for Male Upperclass Students

The University maintains a 100-apartment housing unit which accommodates 280 men. Two-, three-, and four-man apartments are available which vary in size from two to four rooms plus bath. Apartments are fully furnished with beds, chairs, desks, stoves, refrigerators, desk lamps, kitchen table, and rugs. The cost is \$13 per week per student (\$156 per 12-week term) payable at the beginning of the term. The cost includes all utilities and bed linen, which is laundered weekly by the University.

A \$50 deposit is required when making application for the upperclass apartments. Applications are available in the Office of University Housing or by writing the Director of University Housing. Students are expected to make such arrangements on a term-to-term basis but may live in the apartments both while on cooperative work assignments and in school if they wish. All reservations are made on a first come, first served basis.

Fraternity Housing

Certain fraternities provide opportunities for room and board for men at reasonable rates. Information regarding these housing facilities may be obtained from the Office of University Housing.

Regulations Concerning Off-Campus Housing

"Upperclass male students and women students over age 21 are free to make their own housing plans without receiving permission or approval from the University. The local address of all students must be on file with the Registrar's office. Home addresses should only be used by those students who are actually commuting from their home to the university on a daily basis. The proper address must be recorded on the reverse side of the schedule card at the time of registration. It is important for the University to know the current address of all students in case of emergency situations."

All questions regarding the availability of housing should be directed to the Office of University Housing.

THE DIVISION OF COOPERATIVE EDUCATION

The Division of Cooperative Education, under the direction of the Dean of Cooperative Education, administers service programs through three departments as follows:

THE DEPARTMENT OF COOPERATIVE EDUCATION

Supervises all undergraduate cooperative students on their regularly scheduled work periods. This includes placement on job assignments as well as guidance and counseling designed to integrate the work experience into the student's total educational program.

THE DEPARTMENT OF GRADUATE PLACEMENT SERVICES

Offers a placement service for all seniors and alumni of University degree-granting programs. Supervises the placement, guidance, and counseling of graduate students on the cooperative program.

THE CENTER FOR COOPERATIVE EDUCATION

Provides a consulting service for other colleges and universities that are adopting the Cooperative Plan of Education. Develops research projects and publications concerning this method of education.

DEPARTMENT OF COOPERATIVE EDUCATION FACULTY

Professors

Thomas E. McMahon, Associate Dean, B.S., M.Ed.
Sidney F. Austin, Assistant Dean and Director, B.S., M.Ed.
Charles F. Field, B.S., M.Ed.

Associate Professors

Joseph E. Barbeau, B.S., M.Ed.
Ernest V. Barrasso, B.S., M.Ed.
Nancy J. Caruso, B.S., M.Ed.
Paul E. Dubé, B.S., M.A.
Philip W. Dunphy, B.S., M.Ed.
Kenneth R. Hancock, Jr., B.S.
Homer C. Littlefield, B.S.
Paul M. Pratt, B.S., M.Ed.
Harold P. Watts, B.S., M.Ed.

Assistant Professors

Peter H. Akin, B.S., M.Ed.
George K. Howe, B.S.
Robert W. Miller, B.S., M.Ed.
Ralph C. Porter, B.S.
Roderic W. Sommers, B.S.

Instructors

George H. Baillie, B.S.
Corinne Cianci, B.A.
Robert D. Deforge, B.S., M.Ed.
John Dromgoole, B.S., M.Ed.
Mary R. Flynn, B.S.
Elizabeth A. Locke, B.A.
Jane S. Schachter, B.S.

Administrative Assistants

Barbara A. Bowman, B.S.
Rosalind Brawer, B.S.
June L. Carlson, B.A.
Gail Cassidy, A.A., B.A.
Judith P. Clauson, B.A.
Jacqueline C. Downs, B.A.
Marianne Grier, B.A.
Ellen M. Kaplan, B.S.

Marie E. LaRiviere, B.A., M.Ed.
Marcia I. Paullin, A.B.
Joan M. Peshin, B.S.
Margaret A. Rowe, A.A., B.S.
Bonnie Silverstein, B.A.
Angeline Tchinnis, B.A.
Ellen M. Walsh, B.S.
Sarah E. Ward, B.A.

The Cooperative Plan

What It Is



The Cooperative Plan of Education is based on the principle that well-educated individuals can best be developed through an educational pattern which, at periodic intervals, exposes them to the world beyond the boundaries of the campus. Through these controlled and structured experiences the students bring an enrichment to the classroom which enhances their total development. It is a means of combining theory with practice. The essential ingredients are that the experiential phase is considered a degree requirement, and the institution assumes the responsibility for integrating it into the educational process.

It is called "Cooperative Education" because it is dependent upon the cooperation of employers and educators in combining to form a superior total educational program for the students. It is not a system of part-time jobs; nor is it an institutionalized means of "working your way through college." The program has an interrelated work and study content, planned and supervised to produce optimum educational results by providing experience that enhances knowledge associated with the students' professional objectives.

Cooperative education is particularly designed to serve the needs of the recent high school graduate rather than the older, more mature student who already may have had considerable work experience.

In 1960, the Study of Cooperative Education Committee, under the leadership of Dr. Ralph W. Tyler of the Center for Advanced Study in the Behavioral Sciences in California, completed a two-year, nation-wide analysis of Cooperative Education programs. The Committee reported that under this unique system of education the students find greater meaning in their studies, their motivation for academic pursuit is increased, they develop greater skills in human relations, their vocational guidance is improved, and through a reliance on their own judgments they achieve a maturity beyond their years.

Most Northeastern cooperative curricula are five years in length, leading to the baccalaureate degree. In the Colleges of Engineering, Business Administration, Liberal Arts, Nursing, and Criminal Justice, the program consists of a freshman year of three consecutive twelve-week quarters of academic study, followed by four upper-class years on the Cooperative Plan.

In the Colleges of Pharmacy and Education, and in Boston-Bouvé College, only three upper-class years are on the Cooperative Plan with the senior year being one of full-time study. Girls in Boston-Bouvé College may elect a four-year program in which they participate in the Cooperative Plan during the sophomore year only. The curriculum in Physical Therapy is offered only on the four-year plan.

Consult the section in this catalog on the College of Nursing for how the plan operates in that college.

How It Works

Upperclass students are divided into two almost equal divisions, designated "A" and "B." Students in one division start the college year with a quarter of classroom work, while their alternates in the opposite division are on cooperative work assignments. At the end of the quarter the students in each division change places. This alternation of cooperative work experience with classroom work results in each student spending two quarters in school and two quarters on "coop" each academic year of the program.

Each student is assigned to a coordinator who is responsible for all phases of the Cooperative Education program for his group of students. He interviews each student during the freshman year and counsels him regarding the activities of business, industry, government, and the professions as they relate to the student's career objectives. These interviews lead to referral to opportunities which would help the student realize these objectives.

During each of the quarters at college immediately succeeding a quarter on a cooperative assignment, the coordinator confers with the student about the work experience and other matters relating to vocational adjustment or personal problems while on the job. The student's reaction to his situation, coupled with his employer's evaluation of his achievement, is used by the coordinator to guide the student toward his career objectives and to help him obtain maximum value from his education at Northeastern.

Placement

The jobs on which Northeastern students are employed are not protected opportunities or purely observational assignments. They are regular jobs, performed under actual working conditions, offering advancement on the basis of merit. The only privilege accorded Northeastern students is that of attending college on the Cooperative Plan.

The range of opportunities is wide, encompassing all the occupational fields for which the students are preparing at the University. In general the first year of cooperative work can be expected to be of a routine nature, to be followed by increasingly responsible and challenging assignments consistent with the particular student's increase in abilities and aptitudes. Definite training

schedules have been established with many of the cooperating employers. The ultimate objective of such schedules is the employment of well-trained graduates by the company, though such employment is based on merit rather than guarantee.

Because of the uncertainties of the employment market as well as other factors beyond its control, the University cannot guarantee to place all students on cooperative assignments. The University also cannot guarantee to place students in any specific geographic location. However, past experience has demonstrated that students who are willing and capable of adapting themselves to existing conditions are almost never without employment except in periods of severe economic recession.

Value of Program

Cooperative education has a special appeal for students who understand the concept that working for an education is an important part of that education. These are students who appreciate the value of observing the application of what they are learning and applying what is being studied in the classroom to actual work situations. Cooperative education also has a special appeal for those who need motivation, which is sometimes lacking when a student has a constant diet of classroom instruction.

For girls cooperative education has a special significance. They learn how to work under careful supervision, and even though they marry and discontinue their roles as members of the working community, they will always have their experience to rely upon if it becomes necessary in later life to return to the field for which they trained.

Students in Cooperative Education know that their education is unique and superior. They have the opportunity to test the knowledge and ideas generated on the campus in the arena of realistic application. Their exposure to a working environment provides them with insights that enrich the total educational experience. They know that employers in their chosen field will be eager to take advantage of this experience.

LIBRARIES

The library system at Northeastern University consists of the Dodge Library which is the main library, the Suburban Campus at Burlington library and the School of Law Library. In addition, there are two divisional libraries, one in physics and electrical engineering and the other in mathematics and chemistry.

The collections comprise physical volumes, titles and microfilm, periodicals, readings and government document titles.

An inter-library loan system enables students to tap the resources of other libraries in the area.

A handbook and orientation lectures introduce new students to methods of utilizing the resources of the library.

LIBRARY STAFF

Roland H. Moody, A.B., B.L.S., Director

Albert M. Donley, Jr., A.B., M.S., Associate Director

Margaret A. Bixler, B.A.
Reference Assistant

Andrea J. Brooks, B.A.
Pre-Cataloger

Anastasija S. Cakste, M.L.S., M.L.
Cataloger

Donald J. Crouse, B.A.
Reserve Book Librarian

Dolores V. de Silver, A.B.
Assistant Acquisition Librarian

Barbara A. Dickinson, B.A.
Technical Services Assistant
Librarian

Helen B. Goldschmidt, B.A.
Assistant Librarian,
Suburban Campus

John P. Harrison, A.B., M.S.
Head Cataloger

Landon Herrick
Serials Librarian

Barbara F. LaFlamme, B.A.
Circulation Librarian

Lisa S. Liss, B.S.
Cataloger

Tzu Hui Liu, B.A., M.A., M.L.S.
Cataloger

Joyce E. Lunde, A.A.
Reference Librarian

Nancy A. Moore, B.A.
Documents Librarian

Robert G. Murray, A.B., M.Ed., M.L.S.
Head Cataloger

Ann E. Rosenberg
Technical Services Assistant
Librarian

Vivian A. Rosenberg, B.A., M.Ed.
Music Librarian

Margaret F. Smith, B.A.
Cataloger

Leila F. Thompson, B.A., M.S.
Cataloger

Reuben M. Ware, A.B.
Documents Librarian

Ada F. Watts
Acquisition Librarian

Arthur R. Youtz, B.S., B.A., M.A.
Librarian, Suburban Campus

OFFICE OF EDUCATIONAL RESOURCES

The Office of Educational Resources exists to provide: (1) facilities and services that enhance student learning; (2) instructional services and equipment that assist faculty in providing efficient and effective instruction; and (3) research and development directed toward implementing tested instructional systems and innovations. Three divisions carry out the objectives: Programmed Learning, Audiovisual Media, and Instructional Television and Radio. Of particular student interest is the Center for Programmed Study, located in 211 Dodge. There students study courses taught via programs, use programs to supplement courses, provide prerequisite, remedial or review knowledge, or just for fun. Each student's activity and progress are constantly monitored; faculty assist when content problems arise. This service is free-of-charge to full-time students.

OFFICE OF EDUCATIONAL RESOURCES STAFF

James E. Gilbert, B.S., M.S. Director

Thomas E. Hulbert, B.S., M.S. Associate Director

DIVISION OF PROGRAMMED LEARNING

Alvin Kent, B.A., M.Ed.,
Director

D. Daniel Vol Janin, B.S., M.Ed.,
Assistant Director

Renate Lepehne, B.S.

A. Elizabeth Norman, B.S., M.A.

Joseph Spear, B.A., M.A.

Eleanor C. Swett, B.S.

Thomas A. Wills, B.A.

DIVISION OF INSTRUCTIONAL TELEVISION

Roy J. Johnston, B.A., M.A.,
Director

Robert S. Hudson, B.S., T.E.

Harry Cooper, A.B., M.A.

Vaughn Hadley, A.S.

Joan Scolamiera, A.S.

Maureen Leonard, B.F.A.

Priscilla French, A.S.

Joseph Bailer, B.A.

DIVISION OF AUDIO-VISUAL MEDIA

Edward J. Donnelly, B.S.Ed.,
M.Ed., Ed.D., Director

Ann M. Jackson, B.A., M.L.S.

SPECIAL PROJECTS

Geleta F. Fenton, B.S., M.Ed.

Counseling and Testing Center

The University through its Counseling and Testing Center is prepared to assist students with their educational and vocational planning and with personal problems. The student is encouraged to explore his situation fully in the counseling sessions. Psychological tests may be taken to increase the student's knowledge of himself. An extensive file of information about careers and schools is maintained. The services of the Center are available without charge to all students in the Basic Colleges.

Vocational counseling services are also available on a fee basis to high school students and to adults.

The counseling services of the Counseling and Testing Center are approved by the American Board of Counseling Services.

COUNSELING AND TESTING CENTER STAFF

Philip W. Pendleton, A.B., M.A.
Director

Arthur J. O'Shea, A.B., M.A., M.Ed.
Counselor

Priscilla Belcher, A.B., Ed.M.
Assistant Director

Richard S. Seaman, B.A., M.A.
Counselor

Peter A. Kinney, B.A., M.A.
Counselor

Career Information Center

The Career Information Center has the responsibility of preparing career materials for use in high schools and junior high schools. The Center maintains a library of career filmstrips and career tape recordings which are available to Northeastern students who may have a particular interest in the titles prepared by the Center. Arrangements for viewing filmstrips or listening to tapes may easily be made by visiting the Center in 155 Richards.

Reserve Officers' Training Corps

General Objectives

The Department of Military Science is the instructional department of the University which administers the Army Reserve Officers' Training Corps (ROTC) Program. The Reserve Officers' Training Corps is regarded by Northeastern University as an integral part of its educational program, and is made available on a voluntary basis to all male undergraduate students who are otherwise qualified. The University encourages enrollment in the belief that the leadership, citizenship, and military training available to students taking ROTC is beneficial in their over-all development as future leaders.

The Reserve Officers' Training Corps of the United States Army exists for the purpose of developing officers — leaders of men. It offers courses of instruction leading to a commission as a second lieutenant in the United States Army Reserve or the Regular Army. The mission of ROTC is to have ready in time of national emergency a corps of educated, trained military leaders for our nation. Our Northeastern ROTC is an Army, Senior Division, Class CC (Civilian College) unit.

The staff and faculty of the Department of Military Service consist of Department of the Army assigned officers, noncommissioned officers, and civilians assigned by the University. Officers are individually nominated for assignment to the University and are assigned only after records have been reviewed and each individual has been accepted by the University.

Courses of Study

The program of instruction consists of a Basic Course and the Advanced Course. The Basic Course (MS I and MS II), taken during the freshman and sophomore years, includes instruction common to all branches of the Army. The Advanced Course (MS III and MS IV) is presented during the middler, junior, and senior years. Graduates of the Advanced Course receive commissions as second lieutenants in the U.S. Army Reserve or Regular Army.

Enrollment in the ROTC Basic Course

Enrollment in the ROTC Basic Course is voluntary and is open to all male undergraduate students of the Basic Colleges who are physically qualified. Students may withdraw from the Basic Course at the end of the first quarter; those who do not do so are required to complete the two-year Basic Course. The Basic Course may be entered only at the beginning of the freshman year except for veterans and certain students who have had Junior ROTC, for whom a portion of the Basic Course may be waived.

Eligibility for the Advanced Course

The ROTC Advanced Course is available to male undergraduate students of the Basic Colleges who complete the Basic Course, to honorably discharged veterans whose service may be substituted for the Basic Course, or to students who complete a summer camp of 6 weeks following their sophomore year (since the Cooperative Program precludes regularly enrolled students' attending this camp, this method of qualifying for the ROTC Advanced Course will in most cases apply only to transfer students) if:

- (1) they are citizens of the United States and will not have reached 28 years of age at the time of commissioning;
- (2) they successfully complete such survey and general screening tests as may be prescribed;
- (3) they have three academic years to complete for graduation (two for full-time students);
- (4) they are selected by the Professor of Military Science and the University;
- (5) they successfully complete a U.S. Army physical examination.
- (6) they execute a written contract with the Government; and are sworn into the Army Reserve.

Eligibility for ROTC Flight Training

This training is available during the senior year to specially selected cadets who successfully complete U.S. Army Aviation aptitude and physical tests. Flying instruction is conducted on an extracurricular basis by a civilian flying school under contract to the University and the U.S. Army. An Army faculty member supervises the program. Cadets successfully completing the course receive a Federal Aviation Agency Private Pilot's Certificate.

Veterans

Honorably discharged veterans (enlisted) may be enrolled in ROTC with one or both years of the Basic Course waived, depending on prior service. They must be co-aligned in ROTC with other members of their class in the University curricula. Veterans are a distinct benefit to the Corps of Cadets because their actual experiences lend color to the program and help to orient cadets without service. They are especially desired and are normally appointed cadet officers upon enrollment. Certain credits are available to veterans depending upon service. Former commissioned officer veterans are not eligible for ROTC.

Transfer Students

A student transferring to Northeastern University from another institution where he has been enrolled in an ROTC program similar to that at Northeastern is allowed credit for his work. The student's records are obtained from his former professor of military science. Such a transfer student must be co-aligned in ROTC with other students in his class.

Students transferring to Northeastern University as middlers, without previous ROTC training, may enroll in the Advanced Course providing they attend a six-week summer camp prior to the start of the middler year.

Students transferring to Northeastern University as sophomores may also enroll in ROTC as middlers providing they satisfactorily complete a six-week summer camp prior to the start of the middler year.

Transfer students may obtain complete information and assistance from the Department of Military Science.

Uniforms and Equipment

An Army uniform is issued without cost to ROTC students in the Basic Course. Advanced Course students are individually fitted with a uniform, which becomes their personal property upon commissioning, and they continue to wear it as an officer after graduation. The Government furnishes up to \$150.00 toward this uniform. All other equipment, textbooks, etc., required for instruction are provided without charge throughout the five-year program. These items remain the property of the Government, and the students must safeguard them and use them in accordance with University and ROTC regulations. A \$10 deposit is required temporarily from all Basic Course students enrolling in ROTC until uniforms and property are returned in good condition. Any loss or damage to ROTC uniforms and equipment, exceeding the deposit, will be charged to the student.

Academic Credits

The Basic Course may be substituted for physical education as a prerequisite for graduation. Regulations of the individual Basic Colleges prescribe the number of hours of academic credit granted. All ROTC grades are included in computation of the student's QPA.

Pay and Scholarships

All Advanced Course cadets are paid \$50 monthly during actual Advanced Course instruction, a total of \$1,000 during the three years. Camp pay is approximately \$240.00, over and above housing, messing, and medical care, which are free at camp. Transportation to and from camp is paid at the rate of \$.06 per mile.

The Army offers full-tuition five-year scholarships to selected freshmen entering Northeastern University and enrolling in ROTC. Information concerning these scholarships is available to high school seniors by writing to:

Commanding General
First U.S. Army
ATTN: AHAAG-CA
Fort Meade, Md. 20755

Application for these scholarships must be submitted early in January of the senior year in high school. In addition to the five-year scholarships, three-year scholarships for selected cadets entering the Advanced Course are available. These scholarships are awarded at the completion of the sophomore year. All Department of the Army scholarships pay full tuition, books, fees, and an allowance of \$50 a month.

All cadets may also qualify for scholarships of lesser amounts awarded by the University and several cadet societies.

Draft Deferments

Public Law 51 (Universal Military Training and Selective Service Act of 1951 as amended by the Reserve Forces Act of 1955) permits students enrolled in ROTC, who are expected to attain appointments as commissioned officers in the Army Reserve, to be deferred from service for as long as they remain in good standing. ROTC deferment remains in effect until graduation or withdrawal from the University.

Distinguished Military Students

There are military honors for ROTC graduates similar to academic honors for regular graduates. Honor graduates of ROTC are called Distinguished Military Graduates. If they are physically qualified and apply for it, they may be commissioned in the Regular Army instead of the Army Reserve, and enter into a Regular Army career on the same basis as graduates of the United States Military Academy at West Point. This is a splendid opportunity for those who are interested in the many advantages of a Regular Army career.

Cadets are eligible for designation as Distinguished Military Students in their junior year if they possess outstanding qualities of leadership, high moral character, and definite aptitude for the military service; have attained an academic standing in the upper half of their college class and in the upper third of their ROTC class; and further, have demonstrated leadership ability through participation in recognized campus activities.

The Army as a Career

By following any curriculum leading to a degree, and by completing the ROTC Program, a student may qualify for a full-time career in the Regular Army. Cadets who have been designated Distinguished Military Students may apply for an appointment in the Regular Army. Notification of selection is made by mid-December of their senior year. They then become Regular Army officers with all conditions and opportunities for graduate education, on the same basis as graduates of the U.S. Military Academy at West Point.

An Army career as a Reserve Officer on extended active duty also is possible. Many graduates do not request a Regular Army appointment originally, but find the Army enjoyable and satisfying while serving their obligated tours of active duty. Those officers who request continuation and are accepted, serve in the Active Army as Reserve Officers, with the same pay, responsibilities, retirement benefits, and opportunities for promotion as Regular Army officers.

Alumni Association

The 38,000 alumni of Northeastern are united under an all-University Alumni Association which has as its prime purposes the promotion of the welfare of Northeastern University, the establishment of a mutually beneficial relationship between the University and its alumni, and the perpetuation of fellowship among members of the Association.

The Association headquarters and Alumni Lounge are located in Rooms 225 and 226 Richards Hall, respectively. The official records and addresses of alumni are maintained in Room 20 of the Forsyth Annex.

The official publication of the Alumni Association, **The Northeastern University ALUNNUS**, is published quarterly and sent free of charge to all alumni on record.

Activities of the Association, including the Homecoming Day celebration and the annual presentation of Professional Promise awards to outstanding seniors in each of the eight Basic Colleges, are directed by the Association's Vice President of Alumni Affairs. Alumni officers also attend meetings of the undergraduate classes to form a closer relationship between the Association and its future members.

The Alumni Relations Office assists the various class officers in planning class reunions. Each class normally holds a reunion every five years during the month of June. The Vice President for the Alumni Class Council is responsible for co-ordinating class activities and organizing class functions.

The Vice President for Alumni Clubs works in close association with officers of the more than 50 Regional Alumni Clubs which have been established from coast to coast. All alumni are eligible to become members of these organizations. The Alumni Clubs meet periodically, often in conjunction with visits from members of the faculty or with athletic events.

For Boston area alumni, monthly luncheon meetings are held in both the downtown and uptown sections of the city.

The Association also sponsors and assists the Alumnae Association, Varsity Club, Law, Pharmacy, and Boston-Bouvé Alumni Associations, all of which have their own officers and conduct various programs throughout the year. In cooperation with the Varsity Club, the Association presents trophies to the outstanding athlete of the year in each of the six major sports.

The Alumni Association is providing a unique and valuable service both to the University and to the community by sponsoring admissions conferences for parents of high school students who are interested in attending college. Local residents as well as alumni of the University have been invited to these conferences, which help to clarify many of the questions today's parents and young people have concerning application procedures of our colleges and universities.

General Admissions Information

The New England Association of Colleges and Secondary Schools accredits schools and colleges in the six New England states. Membership in one of the six regional accrediting associations in the United States indicates that the school or college has been carefully evaluated and found to meet standards agreed upon by qualified educators. Colleges support the efforts of public school and community officials to have their secondary school meet the standards of membership. Northeastern University has been fully accredited by this agency.

Application for Admission

Applicants for admission to the freshman class must qualify by graduation from an accredited secondary school and must earn the recommendation of their principal or guidance counselor for the particular program to which they have applied. The most important single factor among the credentials submitted to the Committee on Admissions is the candidate's record of achievement in high school or preparatory school.

A combined Application for Admission and School Record form may be obtained by writing to the Department of Admissions, or may be secured at the time of the visit to the University. The Application for Admission should be filled out in ink, properly signed, and forwarded with a non-returnable \$15 fee to the Department of Admissions, Northeastern University, Boston, Massachusetts 02115. Checks should be made payable to Northeastern University.

Admission Plan

Under Northeastern's admission plan, candidates may be notified of their acceptance as soon as the Committee on Admissions has received sufficient evidence to indicate the likelihood of success in study at the University. Each candidate is dealt with individually, and a decision is made as promptly as possible. Acceptances, therefore, may be issued early in the senior year, or after the College Board Aptitude Tests have been evaluated. Other candidates may necessarily wait until the results of Achievement Tests have been evaluated. The quality of the candidate's record through the junior year of high school and the schedule pattern of College Board testing dates have a direct bearing upon the candidate's acceptance data. In all cases, applicants for admission are required to complete successfully their senior year program of studies.

Entrance Examinations

Northeastern requires both the Scholastic Aptitude Test and the Achievement Tests of the College Entrance Examination Board. All candidates write the English Composition Achievement Test. Two other Achievement Tests which must be written will be determined by the particular college or program of studies in which the candidate is interested.

The following may be referred to as a guide; consult each college section for more details.

Fields of Study	Achievement Tests
Education (Physics, Mathematics) Engineering Liberal Arts (Physics, Mathematics)	English Composition Mathematics (Level I) Physics or Chemistry
Education (Biology, Chemistry) Liberal Arts (Biology, Chemistry) *Nursing Pharmacy	English Composition A science Mathematics (Level I)
Boston-Bouvé Physical Education—Women Physical Therapy Physical Education—Men Recreation Education	English Composition Science Mathematics (Level I) or Social Studies (It is recommended that women students in Physical Therapy and Physical Education write the test in mathematics Level I.)
Criminal Justice Education (Elementary, English, Social Studies, Modern Languages, Speech and Hearing Therapy) Liberal Arts (Social Science)	English Composition A choice of two other tests
Business Administration	English Composition Mathematics (Level I) Social Studies

*Achievement Tests optional for the 3-year program

As a general rule, Achievement Tests should be written only in those subjects currently being studied.

Applicants for admission should complete the Scholastic Aptitude Test in May of the junior year, in July before the senior year, or in December or January of the senior year. The Achievement Tests may be completed in March of the senior year or earlier if so advised by an admissions counselor or by the school guidance department.

For full information about College Board Examinations the student should consult his high school guidance office or write directly to:

The College Entrance Examination Board
P.O. Box 592
Princeton, New Jersey 08540

Students on the West Coast should write directly to:

The College Entrance Examination Board
Box 1025
Berkeley, California 94701

Candidates' Reply Date

An accepted student will be asked to submit a non-returnable tuition deposit of \$100 by April 1, 1968. This deposit serves as an indication of intention to enroll and is applied to the student's first-term tuition account. Resident students must make a non-returnable board-and-room deposit of \$100 by April 1. The deposit date may be extended upon special request in writing.

Specific Course Requirements

Applicants for admission to the freshman class must qualify by graduation from an approved course of study in an accredited secondary school. The actual subjects which are prescribed for admission vary somewhat according to the college and program in which the applicant enrolls. These specific requirements are given in the section of this catalog describing the individual colleges and their programs.

Other Requirements

Formal requirements are necessary and desirable in that they tend to provide all entering students with a common ground upon which the first year of college curriculum can be based. But academic credits alone are not an adequate indication of a student's ability to profit by a college education. Consequently, the Department of Admissions takes into consideration a student's interests and aptitudes, insofar as they can be determined, capacity for hard work, attitude toward classmates and teachers in high school, physical stamina and, most important of all, character. In this way the University seeks to select for its student body those who not only meet the academic admission requirements but who also give promise of profiting from the Cooperative Plan of Education.

The Interview

Students who are interested in attending Northeastern are cordially invited to visit the University. Arrangements have been made for a series of Admissions Conferences on Monday through Friday, except for legal holidays, at 10 a.m. and at 2 p.m. Included is a sound filmstrip describing Northeastern and the Cooperative Plan of Education. Candidates who have particular problems of a personal nature may talk with a counselor either before or after the group interview.

Guided tours follow the Admissions Conferences on weekdays at 11 a.m. and 3 p.m. Both should be scheduled in advance.

Because Northeastern does not hold classes for students in the Basic Colleges on Saturdays, applicants are urged to visit the University on a weekday.

Ordinarily, conferences with admissions personnel will be more helpful if candidates have studied the publications, "Adventures in Education" and "Co-opportunities." These are mailed to those who express interest in Northeastern.

Registration

Freshmen in the day programs will register at the Boston Campus on Tuesday, September 10, 1968; at the Burlington Campus, on Wednesday, September 11. Students are not considered to have met the requirements for admission until they have successfully passed the required physical examination. Registration must be in person.

ADMISSION OF TRANSFER STUDENTS

A student wishing to transfer into the Basic Colleges of Northeastern University may request advanced standing as an upperclassman on the basis of acceptable credits earned in an accredited two- or four-year institution or a technical institute.

Basic Requirements

Full details of the University's transfer policy are available from the Department of Admissions upon request. Following are the basic requirements:

1. Only a candidate who presents satisfactory college records may be considered for advanced credit (cumulative average of C+). No credit is given for the lowest passing mark.
2. Credit is given for those courses which are the equivalent of required subjects offered in the particular college at Northeastern. Credit may also be given for elective courses.
3. Candidates must be in good standing and eligible to continue in the institution they are currently attending.
4. Evidence of honorable dismissal and satisfactory health are required. (Appropriate forms will be sent.)
5. Special student status is not possible in any of the Basic Colleges of Northeastern.

Application Procedure

An applicant for advanced standing is required to:

1. Complete an application for admission no later than May 1 of the year of intended entrance. Transfer students are admitted only in September.
2. Submit a transcript of his high school record.
3. Request that an official college transcript of his completed courses be sent, as well as a list of courses which will be completed prior to the end of the academic year.

NOTE: Transfer students are not required to take College Board Tests.

Candidates must apply no later than May 1. All records must be received by the Department of Admissions no later than June 15 of the year of intended entrance. Upon receipt of all items required, the candidate will be notified of the action taken.

Financial Aid

A number of scholarships, loans, and grants are available to qualified transfer students.

Candidates must submit an application to the Office of Financial Aid and file a Parents' Confidential Statement with the College Scholarship Service, Box 176, Princeton, New Jersey, no later than May 1.

Further information may be obtained from the Office of Financial Aid.

Outline of Freshman Courses

The first year is a period of full-time study during which the student must demonstrate fitness for the program which has been elected. The Cooperative Plan of training on the job normally begins with the second year. Students who are unsuccessful in the basic courses of the freshman year will not be permitted to continue with their advanced program, but will be advised to change their goal and type of training. In some instances this will mean change to another curriculum at Northeastern; in others, withdrawal from the institution. The freshman courses are so arranged as to permit change of objective during or at the end of the first year with a minimum loss of time.

College Expenses

Tuition

Tuition rates and fees are subject to revision by the Board of Trustees at any time.

Freshmen — The charge for tuition for all freshmen attending the Huntington Avenue and Burlington campuses is \$465 per quarter.

Engineering Upper-Class Students — The charge for tuition is \$650 per quarter.

Liberal Arts, Education, Business Administration, Pharmacy, Boston-Bouvé, Criminal Justice, and Nursing Upper-Class Students — The charge for tuition is \$625 per quarter.

Student Teaching — The charge for student teaching in the College of Education is \$312.50.

Boston-Bouvé College — The charge for full-term Supervised Student Teaching in Physical Education, Supervised Field Experiences in Recreation, and Supervised Clinical Practice is \$312.50.

Schedule of Tuition Payments, 1968-1969

For Freshmen

<u>Date of Payment</u>	<u>Tuition</u>
September 10, 1968	\$465
December 9, 1968	\$465
March 17, 1969	\$465

Pharmacy students only have a six-week period immediately following the end of Quarter Three. This period is considered a part of the first year. The tuition for this period is \$232.50 and is due on June 16, 1969, the beginning of the term.

Students in Physical Education (Women) have two three-week camp leadership and outdoor education resident sessions at the Warren Center. Charge per session, including prorated tuition, living accommodations and food, approximates \$200. Recreation Education students have one such three-week term course with cost at approximately \$200.

A one-week session in skiing is required for the above groups. Full cost for Ski Week at North Conway, New Hampshire, including lessons and resident costs approximates \$85.

For Upperclassmen (Cooperative Plan)

DATE OF PAYMENT	Tuition for All Colleges Except Engineering	Tuition for Engineering
DIVISION B		
September 16, 1968	\$625	\$650
March 17, 1969	\$625	\$650
DIVISION A		
December 9, 1968	\$625	\$650
June 16, 1969	\$625	\$650

Non Cooperative (Full Time) Plan

Certain students in the College of Liberal Arts and in Boston-Bouvé College may elect a non cooperative (full time) program. Tuition is \$625 for each quarter and is due on the first day of the quarter.

Dormitory Expenses for Freshman Year

For freshmen who reside in University dormitories for the week of orientation and the thirty-six week-freshman year, the cost is \$1,221. This is on a seven-day-a-week basis. Dormitory students must pay, in addition, an infirmery fee of \$10 each quarter.

Students should allow an additional amount for clothing, incidentals and personal expenses. This amount will vary with individual tastes and spending habits.

Schedule of Dormitory Payments

Due September 10, 1968

Dormitory charge	\$429.00
Infirmery fee	10.00
Total	<u>\$439.00</u>

Due on December 9, 1968

Dormitory charge	\$396.00
Infirmery fee	10.00
Total	<u>\$406.00</u>

Due on March 17, 1969

Dormitory charge	\$396.00
Infirmary fee	10.00
Total	<u>\$406.00</u>

Summary of Freshman Expenses Due

	Dormitory Student	Non-Dormitory Student
APPLICATION FEE	\$ 15.00	\$ 15.00

Due September 10, 1968

Tuition, 1st Quarter	465.00	465.00
Laboratory Deposit (if taking)	15.00	15.00
Health Service fee	25.00	25.00
Student Center charge	12.50	12.50
Books & Supplies (Estimate)	75.00	75.00
ROTC deposit (if taking)	10.00	10.00
Dormitory charge (1st Qtr.)	429.00
Infirmary fee (1st Qtr.)	10.00
Total	<u>\$1056.50</u>	<u>\$617.50</u>

(Engineering students should add approximately \$50 for drawing instruments and equipment.)

Due on December 9, 1968 and on March 17, 1969

Tuition	465.00	465.00
Student Center fee	12.50	12.50
Dormitory charges	396.00
Infirmary fee	10.00
Total each quarter	<u>\$ 883.50</u>	<u>\$477.50</u>

REQUIRED FEES FOR ALL STUDENTS

Application Fee

A fee of \$15 is required when the application for admission is filed. This fee is non-returnable.

Accident and Sickness Insurance

The University provides an excellent hospital insurance and student health program. All students will pay a non-refundable University Health Service fee of \$25 per year. This fee will cover the group Blue Cross-Blue Shield program and the medical services which are provided to students by the University Health Service.

Student Center Fee

All students in the Basic Colleges on the Huntington Avenue campus are charged a fee of \$12.50 per quarter for the services available in the Student Center building.

Graduation Fee

A fee of \$25 covering graduation is required by the University of all candidates for a degree. This fee must be paid before the end of the fifth week of the last scholastic quarter in the senior year. Candidates in the College of Nursing are required also to pay a charge of \$9.50 for their graduation pin.

College of Nursing Uniforms

Students in the Associate Degree Program purchase uniforms in the fall quarter of the freshman year.

Students in the Baccalaureate Degree Program purchase uniforms in the fall quarter of the sophomore year.

The cost is approximately \$40.

DEPOSITS REQUIRED

Tuition Deposit

Applicants accepted for admission must upon request pay a non-returnable tuition deposit of one hundred dollars (\$100) as evidence of their intention to enroll, and this will be applied on their first tuition payment.

Dormitory Deposit

Students who have been accepted for admission to a University dormitory must upon request pay a non-returnable dormitory deposit of one hundred dollars (\$100). This deposit will be applied to the first quarter payment.

Laboratory Deposits

Students taking laboratory courses, i.e. Chemistry, Biology, Pharmacy, etc., should be prepared to purchase laboratory deposit cards from the Bursar as directed by the department offering the course. These deposits will be charged with deductions for breakage, chemicals, and destruction of apparatus in the laboratory. Deposit cards are available for \$15 each, and unused portions are refundable.

Reserve Officers' Training Corps—Uniform Deposit

Freshmen enrolling in ROTC make a deposit of \$10 to cover loss of or damage to ROTC uniform and equipment. Any loss or damage exceeding the deposit will be charged to the student.

Payment of Tuition

All payments should be made at the Bursar's Office. Checks should be made payable to Northeastern University. Students are not eligible to attend classes beginning with the second week of any quarter unless their tuition has been paid or specific arrangements have been made with the Bursar for a plan of deferred payment. Deferred payment of tuition entails a fee of two dollars (\$2).

Late-Payment Fee

A fee of five dollars (\$5) will be assessed for failure to make or arrange for payments in accordance with the prescribed regulations.

Late Registration Fee

A fee of \$5 will be charged for failure to register in accordance with prescribed regulations on the dates specified in the college registration bulletins. Registration must be made in person.

Refunds

The general policy in all schools and colleges of the University with respect to refunds of tuition to students is as follows:

The University provides all instruction on an academic quarter basis for which students pay at the beginning of each quarter. Tuition refunds will be granted through the first four weeks of a quarter only when specific conditions are met. Questions regarding refunds should be discussed with the Dean of Students' Office.

Tuition refunds will be granted only on the basis of the date appearing on the official withdrawal application when filed with the Registrar. Non-attendance does not constitute official withdrawal.

Refunds will be granted in accordance with the following schedule:

Amount of Refund

Official Withdrawal Filed Within	Percentage of Tuition
1st week of Quarter	100%
2nd week of Quarter	75%
3rd week of Quarter	50%
4th week of Quarter	25%

Financial Aid

Financial Aid is granted on the basis of financial need. Within the limits imposed by the availability of funds, Northeastern will assist any student in good standing whose personal and family resources are insufficient to meet the cost of attendance.

Students granted financial aid receive, in most cases, a Financial Aid Package which consists of scholarships, loan, and part-time employment.

Scholarships are made available by the state and federal governments and through the generosity of individuals and business organizations concerned with student welfare. With the exception of those scholarships sponsored by the state or federal government, these awards carry a moral obligation for repayment at some future date.

Loan assistance is largely federally guaranteed and requires repayment after graduation at modest interest rates and over a long period of time.

Part-time employment is provided either by Northeastern directly or jointly by Northeastern and off-campus agencies under the auspices of the College Work-Study Program.

Detailed information as to the procedure to follow in applying for aid can be found in the Freshman Catalog and in the Handbook for Students.

SCHOLARSHIPS FOR FRESHMEN

Students interested in applying for freshman scholarships, loans, and employment may obtain detailed information from the Freshman Catalog.

Alumni Scholarships

All Colleges

Four full-tuition scholarships for an entering freshman in each of the Basic Colleges are awarded annually by the Northeastern University Alumni Association through the generosity of donors' gifts to the Alumni Fund.

Applications are open to graduating high school seniors showing evidence of scholastic achievement and financial need.

An equal amount of scholarship assistance is granted by the Alumni Association to students enrolled in University College.

Henry B. Alvord Memorial Scholarships in Civil Engineering

Engineering

Established in 1940 in memory of the late Henry B. Alvord, Professor of Civil Engineering and Chairman of the Department for eighteen years, the award is made annually to a student graduating from an accredited secondary school who demonstrates superior academic ability and gives promise of succeeding in civil engineering. The grant of \$250 is made only to an entering freshman who is qualified for and plans to study civil engineering.

Armstrong Rubber Company Scholarships

All Colleges

Established in 1960, the Armstrong Rubber Company of West Haven, Connecticut, offers annually a scholarship in the amount of \$1,800 to a qualified boy or girl admitted to the University for a full-time program of study. Although children of Armstrong Company employees are given preference, any student residing in New Haven County is eligible to apply.

Recipients of the scholarship will participate in the University's Cooperative Program and will be expected to spend at least four periods of student employment with the firm. Scholarship applications are available from the Company upon request and should be returned to the Personnel Office no later than April 30 of the year in which the student plans to enter the University.

Badger Company, Inc., Grant Program

Engineering

The Badger Company, Inc., has made available to Northeastern University two grants of \$1,200 each to be given to first-year students. Recipients must be from the secondary schools in the Greater Boston area who have been accepted into the College of Engineering. Summer employment shall be available to the recipient(s) of the grant during the summer before his matriculation at the University; and cooperative work will be offered as long as positions are available, during his undergraduate years.

Board of Higher Education Scholarships

All Colleges

This program was established in 1957 by the Commonwealth of Massachusetts to provide scholarship aid to Massachusetts students pursuing full-time day schedules in accredited collegiate institutions. Awards are made in the fall of each year, and applications for freshmen are available through their high school guidance counselors.

The Godfrey L. Cabot Scholarship Fund

All Colleges

This fund was established by Dr. Cabot in 1954 in order to help meet the college expenses of employees or children of employees of Godfrey L. Cabot, Inc., and its subsidiary and associated companies. To be eligible, the employee must have completed at least five years of service to the company prior to the time the student enters the University. The University shall determine the number and amount of these scholarships, which are not limited to outstanding students and which are available to evening as well as day students. Students interested in applying for scholarship aid from this fund should communicate with the Cabot personnel office or the Office of Financial Aid at Northeastern University.

The Gardner A. Caverly Scholarship

All Colleges

This scholarship was established in 1957 through the generosity of Mr. Gardner A. Caverly, an alumnus of the College of Business Administration and a member of the Class of 1934. Its purpose is to provide financial assistance and encourage qualified students from the New England area to attend Northeastern University. In selecting worthy students for these scholarship awards, preference is given to graduates of the Rutland, Vermont, and Laconia, New Hampshire high schools.

Community Scholarships

All Colleges

The Community Scholarships were established by President Asa S. Knowles in 1963. Northeastern will grant scholarships in the amount of \$500 to qualified students from the following communities: Ashland, three scholarships; Boston, twelve scholarships; Burlington, three scholarships; and Weston, three scholarships.

The Cotrell Company Engineering Scholarship

Engineering

In 1961, The Cotrell Company of Westerly, Rhode Island, established an annual scholarship of \$1,000 to be awarded to a senior in the upper fourth of his class attending a high school in the Westerly area or to a senior in any high school who is the son of an employee of The Cotrell Company. Selection preference will be given to sons of employees and to students who have a long-range interest in the specialized fields of mechanical, electrical and industrial engineering.

The William O. DiPietro Scholarship

Engineering

This scholarship was established in 1967 through the generosity of Mr. William O. DiPietro, a distinguished alumnus of the College of Engineering and a member of the Class of 1942. The scholarship is awarded annually to one or more deserving freshmen who demonstrate a high caliber of achievement and a desire to fulfill the limits of their ability in both academic and cooperative periods of study. In considering recipients for this scholarship, preference is given to freshmen enrolled in the College of Engineering desirous of majoring in Chemical Engineering. It is intended that those students receiving awards from this scholarship might someday contribute to this or other scholarships themselves, thereby perpetuating growing funds that will help other deserving individuals.

Educational Opportunity Grants

All Colleges

As part of the federally supported programs administered by the University, Educational Opportunity Grants will be available to a limited number of undergraduate students with exceptional financial need who require these grants to attend college. To be eligible, the student must also show academic or creative promise.

Eligible students who are accepted for enrollment or who are currently enrolled in good standing, may receive Educational Opportunity Grants for a maximum of four years of their higher education.

Grants will range from \$200 to \$800 a year, and can be no more than one half of the total assistance given the student. As an academic incentive to students, an additional award of \$200 may be given to those students who were in the upper half of their college class during the preceding academic year.

Carl Stephens Ell Alumni Scholarships

All Colleges

To honor Dr. Carl Stephens Ell, the second president of Northeastern University, the Alumni Association, in 1958, established these scholarships. Either freshmen or upperclassmen enrolled at the University are eligible. Awards will be made to worthy students on the basis of scholastic ability and need. The scholarships are to be distributed as equitably as possible among students in the Basic Colleges and University College. Preference shall be given to sons and daughters of Northeastern Alumni.

Elmer H. and Daisy M. Everett Scholarship

All Colleges

The purpose of this fund, established in 1961, by Mr. and Mrs. Elmer H. Everett, is to provide scholarship aid for a qualified entering freshman or upperclass student who will receive the greatest benefit from this assistance. The scholarship, to be awarded annually, will be equal to one-half tuition for a full academic year.

Preference will be given to a worthy student who is a member of, or the son or daughter of a member of, the Carter Memorial Methodist Church of Needham Heights, Massachusetts, or to another student suggested by the minister of this church. Should there be no qualified candidate available from the above source, then the scholarship shall be awarded to any worthy boy or girl.

The George Raymond Fennell Memorial Scholarships

Business Administration

Two full-tuition scholarships are awarded each year to first-year students enrolled in the college of Business Administration. The scholarships are awarded in memory of George Raymond Fennell, formerly Assistant Director of Admissions and Director of the Northeastern Student Union.

General Motors Scholarship

All Colleges

General Motors has a vital interest in higher education in America. Under its "College Plan," one five-year scholarship is granted to a high school senior of high ability who has been admitted to one of Northeastern's Basic Colleges. The selection is made from among all students accepted for admission. A special application is not required.

College of Nursing Scholarships

Nursing

Scholarships are made available to students in the College of Nursing through a fund established by contributions from Northeastern University, Permanent Charities Fund, Massachusetts General Hospital, Children's Hospital Medical Center, Beth Israel Hospital, New England Deaconess Hospital, and Peter Bent Brigham Hospital. The application procedures and qualifications for selection are the same as those for all other scholarships.

Charles Hayden Memorial Scholarships

All Colleges

The Charles Hayden Foundation, created by the will of the late Charles Hayden, an alumnus of the Boston English High School, offers annually memorial scholarships to freshmen at Northeastern University. The scholarships are awarded to "deserving boys" whose parents are unable to finance the entire cost of their education.

Regional Scholarships

All Colleges

Secondary school students who do not reside within normal commuting distance of Northeastern University, who have demonstrated superior achievement in their studies, and who are strongly endorsed by their principals and guidance officers, may qualify for a Regional Scholarship. Scholarships range in amount from \$1,000 to \$2,400. Recipients are required to live in University-sponsored residence halls.

Clinton H. Scovell Scholarships

Boston-Bouvé

Scholarships are made available annually to women students in Boston-Bouvé College through a fund provided by the will of Clinton H. Scovell.

The Sidney L. Sholley Memorial Scholarships

All Colleges

The Sidney L. Sholley Memorial Scholarships have been established by the Trustees of the Keystone Charitable Foundation in memory of Mr. Sidney L. Sholley, founder and first president of the Keystone group of mutual funds. Two scholarships of \$600 each will be awarded annually to incoming freshmen. Recipients of the scholarships will be known as the Sidney L. Sholley Scholars.

The Northeastern University**Faculty Wives Scholarship**

All Colleges

Each year the Northeastern University Faculty Wives Club offers a half-tuition scholarship to a young woman of limited financial resources who has demonstrated a likelihood of succeeding in her chosen professional field.

Trustee Scholarships

All Colleges

Established in 1928 by the Board of Trustees of Northeastern University, these full- and partial-tuition scholarships are granted in the eight Basic Colleges each year to entering freshmen who have demonstrated superior scholastic attainment throughout their preparatory or high school courses.

Power Systems Engineering Grants-in-Aid Electrical Engineering

A number of public utilities and power equipment manufacturing companies in the northeastern part of the United States have made available grants-in-aid ranging from \$1,000 to \$1,800 to assist able freshmen who are planning to undertake the six-year integrated cooperative program in power systems engineering leading to the degrees of Bachelor of Science and Master of Science in Electrical Engineering. These awards are made on the basis of academic achievement in high school and aptitude for and interest in the field of power systems engineering, without regard to financial need.

Candidates for such grants-in-aid should apply to the Dean of Admissions at Northeastern University not later than March 1 of the year in which they wish to enter the College of Engineering.

SCHOLARSHIPS FOR UPPERCLASSMEN**Dr. Martin E. Adamo Scholarship**

Pharmacy

This scholarship of \$100 is given annually by the Boston Association of Retail Druggists in memory of Dr. Martin E. Adamo, the second president of the New England College of Pharmacy.

The Vivian B. Allen Scholarships

Nursing

The Vivian B. Allen Foundation Endowment for nursing scholarships was established in 1968 through the generosity of the Vivian B. Allen Foundation, Inc. The income from a \$500,000 endowment fund is to be used to provide scholarship assistance for students entering or enrolled in the College of Nursing of Northeastern University. The application procedures and qualifications for selection are the same as those for all other scholarships.

American Foundation for Pharmaceutical Education Scholarships

Pharmacy

The Board of Grants of the American Foundation for Pharmaceutical Education provides three scholarships of \$200 each to be awarded to junior or senior students on the basis of scholarship and financial need with the understanding that the University will match the awards to the students selected. The use of the funds is restricted to the payment of tuition and laboratory fees.

The Boston Section of the American Society for Quality Control Scholarship

All Colleges

This annual award was established in 1961 by the Boston Section of the American Society for Quality Control to provide assistance to a student enrolled in a collegiate program which will prepare him for a constructive career in the broad field of quality control. The recipient must have completed his second year; and in his education or work experience, he must have demonstrated an interest in the broad field of quality control.

The Boston Section has an extensive educational program for those whose work requires an increasing knowledge of quality control, and it is active in enhancing the standards in this field.

The Henry Francis Barrows Scholarships

All Colleges

Established in 1949, the four Henry Francis Barrows Scholarships provided under the will of Fanny B. Reed, are offered to Protestant young men, born and brought up in New England. Good scholastic standing, good character, and need must be demonstrated by recipients of the scholarships.

The Mr. and Mrs. Emil Matthew Bauer Fund

All Colleges

The interest from the Fund, established in 1954, is used for scholarships or other financial assistance to students of German birth or of German extraction studying at Northeastern University. The scholarships are available to either men or women students enrolled in any year at the University.

Board of Higher Education Scholarships

All Colleges

This program was established in 1957 by the Commonwealth of Massachusetts to provide scholarship aid to Massachusetts students pursuing full-time day schedules in accredited colleges. Awards are made in the fall of each year, and applications for upper-class students are available during April in the Office of the Director of Financial Aid for Students.

The Boston Paper Trades Association, Inc., Scholarship

Business Administration

Established in 1966 by the Boston Paper Trades Association, Inc., this is an annual scholarship awarded to a junior or senior who has demonstrated by his cooperative work achievement and his extracurricular activities an interest

and potential in the field of sales. The recipient must be of high character, have a good academic record, and be able to demonstrate financial need.

The Boston Rubber Group Scholarship

Chemistry, Chemical Engineering

This scholarship, established in 1962, is to be awarded in whole or in part to one or more chemistry or chemical engineering cooperative students on the basis of merit, need, scholarship, and personal qualifications. The Boston Rubber Group is sponsored by the Division of Rubber Chemistry, American Chemical Society.

Boston Society of Civil Engineers Scholarship in Memory of

Desmond FitzGerald

Civil Engineering

In 1931 the Boston Society of Civil Engineers established a scholarship in memory of Desmond FitzGerald, a former president of the Society and an eminent hydraulic engineer with a distinguished record of service.

It has been awarded annually since 1931 to an outstanding Northeastern University senior or junior student in the Department of Civil Engineering of the College of Engineering. The presentation is made by the President of the Boston Society of Civil Engineers at the Society's annual meeting in the spring of the year.

Brookline Hospital Women's Auxiliary Scholarships

Nursing

These scholarships, two \$1,000 awards, are available to upper-class nursing students, with preference being given to residents of Brookline. Selection is on the basis of good academic standing and demonstrable financial need.

Martin Brown Scholarship Fund

Electrical Engineering

This scholarship was established in 1961 by Mr. Martin Brown, an engineering alumnus of the Class of 1921. The purpose of this scholarship is to assist qualified students enrolled in electrical engineering who have need and who have demonstrated above-average scholastic ability.

Wellington Burnham Fund

All Colleges

This fund provides financial assistance to worthy students of limited means without discrimination as to race, creed, color, or scholastic attainment. It was established in 1961 under the provisions of the will of George A. Burnham.

The William M. Cavanaugh Memorial Scholarship

All Colleges

This award, established by the members of the Publicity Club of Boston, is open to men and women of the Junior and Senior classes who demonstrate talent in the field of communications. The scholarship of \$100 bears the name of the second president of the Publicity Club (1950-1951) who fulfilled the role of an able and successful newspaper man.

Chemical Club of New England

Chemistry,
Chemical Engineering

To promote interest in the chemistry or chemical engineering field in New England, the Chemical Club of New England has made generous scholarships available to junior and senior students who are majoring in chemistry or chemical engineering and who show promise of success in either field.

Recipients of these scholarships must be residents of New England and must have financial need, above-average grades, and a good cooperative work record.

Civil Engineering Department Award

Civil Engineering

The Civil Engineering Department Award was established by members of that department in order to recognize achievement and to give financial assistance to a student who has elected a major in the field of civil engineering. This award, in the amount of \$100, is financed by gifts from members of the Civil Engineering Department and is awarded to the recipient at the beginning of his sophomore year.

Connecticut Alumni Club Scholarships

All Colleges

Each year the Connecticut Alumni Club awards scholarships to students from the state of Connecticut who have achieved a high academic average in their freshman year and have demonstrated financial need. The scholarships are to be used toward the tuition expense of the sophomore year. These scholarships were established in 1958 to promote Northeastern University among the preparatory schools of Connecticut.

John W. Dargavel Foundation Scholarship

Pharmacy

This scholarship was established in 1964 by the John W. Dargavel Foundation, sponsored by the National Association of Retail Druggists. The award is limited to students who have completed their sophomore year in the College of Pharmacy.

Luis de Flores Endowment Fund

All Colleges

This fund was established in 1964 to provide yearly awards to students in recognition of superior ingenuity, irrespective of general academic standing.

Electrical Manufacturers Representatives Club of New England, Inc., Scholarship

Electrical Engineering

Established in 1958, this scholarship of \$475 is granted to a student or students majoring in electrical engineering, without regard to race, creed, or color. To qualify students must have real financial need and excellent scholastic standing.

Carl Stephens Ell Alumni Scholarships

Elmer H. and Daisy M. Everett Scholarship

(For description of these two scholarships, see page 54.)

Clara and Joseph F. Ford Scholarship

All Colleges

In 1947 friends and employees of Clara and Joseph F. Ford united to provide tuition scholarships for worthy, needy, and well-qualified students who have demonstrated a democratic and tolerant spirit and who are well disposed toward people of all creeds and races.

Gilman Brothers Inc. Scholarship

Pharmacy

This scholarship of \$250 is given annually by Gilman Brothers Inc. to help a student further his education in pharmacy.

Rabbi Myer O. Grunberg Scholarship

All Colleges

Established in 1953 by Mrs. Myer O. and Miss Rose Grunberg, this annual award is available to a senior student in any college of the University. The award is made to that man or woman student who has evidenced in personal, business and student relations those characteristics of leadership and human relations which make for a better social order. There is no restriction as to race, creed, color, or sex.

Health Professions Scholarship Program

Pharmacy

Under a grant from the Public Health Service, annual scholarships not in excess of \$2,500 may be awarded to students from low-income families who, without such financial assistance, could not pursue a course of study in the health professions. The scholarships are available to middlers, juniors, and seniors in the College of Pharmacy.

Joseph Anthony Johnson Scholarships

Engineering

Established in 1968 by the will of the late Joseph Anthony (Johansen) Johnson of the Class of 1928, the income provides scholarship aid for students enrolled in the Department of Mechanical Engineering, with preference given to students of Scandinavian origin.

Vena Morse Lamson Scholarships

All Colleges

These scholarships are provided through the income of a fund established in 1963 by Horatio W. Lamson in memory of his beloved wife. The scholarships are awarded annually to needy and worthy students who are enrolled in any of the Basic Colleges of the University. The scholarships are granted by the Committee on Financial Aid of the University without regard to national origin, sex, race, or creed.

Avrom Aaron Leve Memorial Scholarship

Psychology

This scholarship fund was established in 1957 in memory of Dr. Avrom Aaron Leve, former Assistant Professor of Psychology. The interest is used annually to provide scholarships for upper-class students majoring in psychology. The award is made on the basis of academic achievement, financial need, and character.

George T. Marvin Scholarship Fund

All Colleges

This fund was established in 1961 under the provisions of the will of George T. Marvin, a graduate of the Northeastern University School of Law, Class of 1918. Mr. Marvin designated that the income of this fund should be used to provide financial assistance to worthy and needy students to assist them in furthering their education at Northeastern University.

George T. Marvin Scholarships may be awarded to new students seeking admission to Northeastern and to students enrolled as freshmen and upper-classmen. Applicants must have satisfactory records of scholarship as of the time of making application and must demonstrate genuine need and good citizenship.

Massachusetts State Pharmaceutical Association

Pharmacy

This scholarship of \$200 established by the Massachusetts State Pharmaceutical Association, is awarded annually. The recipient must be a resident of Massachusetts.

The Massachusetts State Pharmaceutical Association also awards a number of scholarships of \$100. Applications for these scholarships may be secured from the office of the Association at 11 Beacon Street, Boston.

McKesson & Robbins, Inc., Scholarship

Pharmacy

This scholarship of \$200, given annually by McKesson & Robbins, Inc., is awarded to a worthy student in financial need.

Frederick W. Muckenhaupt Scholarship

All Colleges

This award was established in 1961 by Dr. and Mrs. Carl F. Muckenhaupt in memory of their son, Frederick W. Muckenhaupt, Class of 1959 of the College of Engineering.

The award is to be made annually to a student in good standing on the basis of need. Preference is given to a student enrolled in the Department of Electrical Engineering.

The New England Paper Merchants, Inc., Scholarship All Colleges

Established in 1959 by the New England Paper Merchants Association, Inc., this is an annual scholarship awarded to a junior or senior who has demonstrated by his cooperative work achievement and his extracurricular activities an interest and potential in the field of sales. The recipient must be of high character, must be able to demonstrate financial need, and must have a good academic record.

Norfolk County Pharmaceutical Association Scholarship Pharmacy

This scholarship of \$50 is awarded annually to a student who meets the requirements both financially and scholastically and is a resident of one of the member towns covered by the Norfolk County Pharmaceutical Association (Norwood, Dedham, Canton, Walpole, Millis, Needham, Westwood, and Islington).

Physical Therapy Traineeships

Boston-Bouvé

Undergraduate traineeships in physical therapy are made available to the University through the Department of Health, Education, and Welfare. Junior and senior physical therapy majors recommended by the faculty may receive substantial financial awards which can be applied toward their college expenses.

The Mildred A. Reardon Scholarship Award

All Colleges

Delta Pi Alpha Sorority sponsors an annual award of \$100 to a deserving under-class woman in the Basic Colleges. Selection is made by the Dean of Women on the basis of financial need and academic standing. The award is given in honor of an outstanding alumna of Northeastern and Delta Pi Alpha, whose academic excellence, strength of character, and qualities of leadership have typified the ideal for which the sorority strives.

Frank B. Sanborn Scholarship Fund

Engineering

The Frank B. Sanborn Scholarship Fund was established in 1958 to provide a scholarship or scholarships of not more than \$500 to worthy and needy students selected by the University, without restrictions as to race, creed, or geographic origin, but with preference being given to students majoring in electrical, mechanical, civil, or industrial engineering, in the order stated.

Each recipient must be willing to assume a moral obligation to reimburse the fund as he may be able, in order to make similar financial aid available for other students in later years. There shall be no interest charged and no time specified for reimbursement.

Clinton H. Scovell Scholarships

Boston-Bouvé

Scholarships are made available annually to women students in Boston-Bouvé College through a fund provided by the will of Clinton H. Scovell.

William Lincoln Smith Scholarship Fund Electrical Engineering

The fund was established in 1947 by Farnham Wheeler Smith, Class of 1924, Benjamin Lincoln Smith, Class of 1923, Thomas Hollis, Jr., Class of 1941, and other members of the family in honor of Dr. William Lincoln Smith, who served long, faithfully, and with distinction as Chairman of the Department of Electrical Engineering at Northeastern University.

The income from the fund is used for an annual scholarship award to a student enrolled in the Department of Electrical Engineering who has demonstrated excellence in some aspect of electrical research, stands high in his courses, or otherwise exhibits promise of future competence in the field. The award shall preferably be granted to a student who needs financial assistance to continue his college work.

South Middlesex Pharmaceutical Association Pharmacy

This tuition scholarship of \$100 established in 1960 is awarded annually to a pharmacy student enrolled in the third, fourth, or fifth year who is in good scholastic standing and in financial need, and living in the area covered by the South Middlesex Pharmaceutical Association (Arlington, Belmont, Lexington, and Watertown). The recipient will be selected by the Scholarship Committee.

South Shore Pharmaceutical Association Scholarship Pharmacy

The Scholarship Committee of the Association will select a freshman student in June of each year living in the area covered by the South Shore Pharmaceutical Association (Quincy, Braintree, Weymouth, Hull, Randolph, Hingham, Holbrook, and Cohasset) who will be awarded a \$100 scholarship to be applied to the tuition of the first semester of the sophomore year.

Springfield Druggists' Association Scholarship Pharmacy

A scholarship of \$100 is offered by the Springfield Druggists' Association. This is to be awarded to a sophomore or junior who maintains the highest average in the Department of Pharmacy, and who is worthy and in need of financial assistance. The Springfield Druggists' Association Scholarship Fund was established in 1956.

Ruth Page Sweet Scholarship Fund Boston-Bouvé

This fund was established in 1959 by members of the Class of 1919 and alumnae of the Bouvé-Boston School in honor of their classmate, Miss Ruth Page Sweet, dean of the school from 1929 to 1946, administrative director from 1946 to 1948, and director from 1948 to 1960. The scholarship is presented to a junior or senior who has demonstrated by her academic record and extracurricular activities a high level of professional promise.

A. Gilbert Tenney Scholarship Fund Engineering

This fund is in memory of A. Gilbert Tenney, who served as a captain in the Air Force during the Korean War and was killed while in active service.

The income from the fund will be awarded to a needy student or students in the field of electrical engineering, studying under the Cooperative Plan of Education.

Charles Irwin Travelli Scholarships

All Colleges

Numerous scholarships have been given yearly since 1950 to students demonstrating financial need, high academic achievement, and an active interest in University life as shown by participation in one or more major activities. Students are named as recipients of Travelli Scholarships at the completion of their sophomore year. Under normal circumstances these awards will continue through the senior year.

Samuel Ulman Scholarship Fund

All Colleges

This fund was established in 1960 by Mrs. Samuel Ulman in memory of Samuel Ulman, a student at Northeastern University from 1912 to 1915. The purpose of the fund is to provide scholarship assistance to students in good academic standing who have financial need.

United States Rubber Company Foundation Scholarships

Engineering, LA, BA

The United States Rubber Company Foundation has established scholarships to be awarded to students in the Colleges of Engineering, Business Administration, and Liberal Arts who qualify on the basis of leadership and character, academic performance and potential, need for financial assistance, and demonstration of interest in a career in industry.

Recipients assume a moral obligation to repay at least 25 per cent of any scholarship received to the University Scholarship Fund after graduation. Students must have completed at least two years of their undergraduate program to be eligible.

University Scholarships

All Colleges

Northeastern University has for many years maintained a scholarship fund for deserving, qualified students. These scholarships are awarded on the basis of need, scholastic standing, and campus citizenship. The recipient of a Northeastern scholarship must be willing to assume a moral obligation to repay the University at some future date.

Henry E. Warren Scholarships

All Colleges

Established in 1958 by the Warren Benevolent Fund, Inc. The purpose of these scholarships is to encourage students to gain cooperative work experience reinforcing study in their major field.

Scholarship awards in the total amount of \$1,000 are awarded annually without restrictions as to race, creed, or national origin, to upper-class students in fields in which related cooperative work positions are few or poorly paid. The recipients of the scholarship must have demonstrated good scholastic standing, fine character, and financial need.

The Jacob Wasserman Scholarship Fund

Pharmacy

Established in 1966 by his friends in memory of Jacob Wasserman, this fund is to provide scholarship aid to a senior student in the College of Pharmacy. The award will be made annually on the basis of financial need, academic performance, and personal qualities.

Western Electric Fund Scholarship Award

Engineering

This scholarship, established in 1956, is awarded annually to an upper-class student in mechanical, electrical, or industrial engineering. The recipient must be an outstanding student who also has financial need. The Western Electric Company is the manufacturing company for the Bell Telephone System.

Student Activities



Northeastern University regards student activities as an integral part of its threefold educational program along with academic and cooperative education. The purpose of the Northeastern activities program is to provide all students with a variety of opportunities for experience, training, recreation, and spare-time interests. By participating in activities, students add to their education and personal development, build up an asset which may be as important upon graduation as their academic record, and make a significant contribution to the University.

Athletics

The University recognizes as major sports baseball, basketball, crosscountry, football, track, hockey and crew. Minor sports teams are active in skiing, sailing, and riflery. Intramural sports are organized for both men and women.

DEPARTMENT OF ATHLETICS STAFF

Professors

Herbert W. Gallagher, B.S.
 Director
 Joseph P. Zabalski, B.S.
 Football Coach

Assistant Professors

John J. Connelly, Jr., B.S.,
 Ed.M., Baseball Coach
 Richard E. Dukeshire, B.A.
 Basketball Coach

Athletic Staff

G. Ernest Arlett,
 Crew Coach
 Frank P. Barrett, B.S.
 Assistant Crew Coach
 James L. Bell, B.S., M.S.
 Hockey Coach

Athletic Staff (continued)

Irwin M. Cohen, B.S., Ed.M.
 Track Coach
 William J. Corsetti, B.S.
 Assistant Track Coach
 Ecio Luciano, Ph.B.
 Assistant Football Coach
 Robert P. Lyons, B.S.
 Assistant Football Coach
 Wilhelm J. Nelson, A.B., M.Ed.
 Business Manager
 Peter D. Nixon, B.A., M.B.A.
 Assistant Basketball Coach
 Paul G. Solberg, B.S.
 Freshman Basketball Coach
 Gerald R. Tatton, B.A., M.A.
 Assistant Track Coach
 Henry B. Woronicz, B.S.
 Assistant Football Coach

Arts

Participation in the creative arts is encouraged through the Art Club, Band, Chorus, Chamber Orchestra, Dramatics: Silver Masque (major productions) and Studio Theatre, Jazz Society, and Chapel Choir.

Professional Organizations

The College of Engineering sponsors student chapters of the following:

American Society of Mechanical Engineers
 American Society of Civil Engineers
 American Institute of Chemical Engineers
 American Institute of Industrial Engineers
 Institute of Electrical and Electronics Engineers
 Society of Women Engineers

The College of Business Administration offers participation in the student chapters of national organizations in the following fields: Accounting, Advertising, Finance, Marketing, and Management.

The College of Liberal Arts sponsors the following: Anthropology, Biology, Chemistry, Debate, History, Mathematics, Physics and Sociology.

The College of Education sponsors the Student Chapter of National Education Association.

The College of Pharmacy recognizes the Student Chapter of the American Pharmaceutical Association and five professional fraternities and sororities.

Boston-Bouvé College has student chapters of the American Association for Health, Physical Education, and Recreation, and the American Physical Therapy Association.

Publications

CAULDRON: The Senior Class annual is prepared throughout the year and distributed without charge to seniors preceding Commencement. Members of all colleges and classes are eligible for the staff. The CAULDRON provides opportunities for photographic and editorial experience.

NORTHEASTERN NEWS: The award-winning University weekly paper is produced entirely by students. A large staff is selected from applicants of all colleges and classes. Freshmen are encouraged to participate. An intern training program prepares students for advancement and election to the NEWS Board.

SPECTRUM: The University literary magazine publishes creative student writing selected by an Editorial Board. It is professionally printed and sold throughout the University.

Religious Organizations

Although the religious life at Northeastern emphasizes the interfaith and ecumenical spirit, denominational student organizations are given full support on campus. Each group has its chaplain, its officially-appointed faculty adviser, and its student officers. The activities and special programs of these clubs, representing a wide diversity of creeds, are coordinated by the Interfaith Council.

Social Organizations

The University has chartered some fourteen fraternities, four sororities and a number of other Greek Letter social groups, both national and local.

Other groups primarily social or for school spirit and service are the Student Union and the Husky Key, WNEU Radio Station, the Hus-Skiers and Outing Club, and the Bridge Club.

Student Government

CLASS BOARDS: Each class has an elected class board which is the governing body of the class. From this Board the various class officers are chosen: President, Vice-President, Secretary and Treasurer. A fifth member is an ex-officio member of the Student Council and is assigned to represent his class.

STUDENT COUNCIL: The Student Council is a group of 82 elected representatives of all undergraduates enrolled in the several colleges of Northeastern University, who serve as a legislative-advisory body for the consideration of problems and policies affecting the entire student body.

The Council is the official liaison between the students and the University administration. In certain areas of student affairs, the Council serves as a legislative body. In areas involving academic policies, which are primarily the concern of the faculty, the Council serves as an advisory body.

HONORS AND AWARDS

The University encourages the achievement of excellence in scholarship by making monetary awards and chartering honor societies in the various academic disciplines.

Honor Societies

Twelve honorary societies are chartered in the Colleges:

Phi Kappa Phi — national interdisciplinary honor society

Tau Beta Pi — in the College of Engineering (Massachusetts Epsilon Chapter)

Nu Chi Epsilon — in the College of Engineering, Department of Chemical Engineering

Eta Kappa Nu — in the College of Engineering, Department of Electrical Engineering, Gamma Beta Chapter)

Pi Tau Sigma — in the College of Engineering, Department of Mechanical Engineering (Northeastern Tau Kappa Chapter)

Phi Alpha Theta — in the College of Liberal Arts, History Department (Northeastern Zeta Tau Chapter)

Pi Sigma Alpha — in the College of Liberal Arts, Political Science Department (Northeastern Delta Gamma Chapter)

Alpha Pi Mu — in the College of Engineering, Department of Industrial Engineering

Chi Epsilon — in the College of Engineering, Department of Civil Engineering

Kappa Delta Pi — in the College of Education

Beta Gamma Sigma — in the College of Business Administration (Massachusetts Delta Chapter)

The Academy — in the College of Liberal Arts

Alpha Kappa Delta — in the College of Liberal Arts, Sociology Department

Rho Chi Society (Beta Tau Chapter) — in the College of Pharmacy

Election to the college honorary societies is based primarily upon scholarship, but, before a man or woman is privileged to wear the honorary society insignia, there must be evidence of an integrity of character and an interest in the extracurricular life of the University. The societies have memberships consisting of the outstanding men and women in the Colleges. Election to an honorary society is the highest honor that can be conferred upon an undergraduate.

AWARDS FOR UPPERCLASSMEN

University awards are determined by scholastic and citizenship achievement. They are presented by appropriate committees headed by the Dean of Students and do not require a demonstration of financial need or formal application.

The Academy Award

Liberal Arts

The Academy, the honor society of the College of Liberal Arts, offers annually an award of \$100 to the sophomore in the College of Liberal Arts who, during the previous year as a freshman, made the highest scholastic record.

William Jefferson Alcott, Jr., Award

All Colleges

This award of \$200 was established in 1934 by members of the faculty and other friends to perpetuate the memory of William Jefferson Alcott, Jr., a brilliant member of the Northeastern Department of Mathematics from 1924 until his death in 1933. The award to a senior is made annually from the income of the fund "for outstanding performance, either in the way of unusual excellence in routine work, or in connection with some intellectual activity outside or beyond the requirements of the curriculum."

Alumni Awards for Professional Promise

All Colleges

Established in 1947 by the Alumni Association, these awards are presented annually at a final senior class meeting in the spring of the year. The awards are made to the outstanding seniors in each of the Basic Colleges who have demonstrated unusual professional promise through their character traits, scholastic achievement, and cooperative work performance.

The Beta Gamma Sigma Society Award

Business Administration

The Massachusetts Delta Chapter of Beta Gamma Sigma, the national honorary society of colleges of business administration, offers an annual scholarship of \$100 to the sophomore in the College of Business Administration who, during the previous year as a freshman, made the highest scholastic record.

Cooperative Education Awards

All Colleges

These awards are presented to seniors in each of the Basic Colleges in recognition of outstanding performance in the Cooperative Education Program, through which they have personified the objectives and ideals of the University. The awards are presented at the Annual Awards Luncheon.

Sears B. Condit Honor Awards

All Colleges

These awards were established in 1940 through the generosity of Sears B. Condit. At Honors Day Convocation, Sears B. Condit Honor Awards, approximately 40 in number, are awarded annually to outstanding students in the senior class. Each award carries a stipend of not less than \$150 as well as a certificate of achievement.

Alfred J. Ferretti Award

Engineering

Tau Kappa Chapter of Pi Tau Sigma, the Mechanical Engineering National Honor Fraternity, sponsors an annual award to the sophomore mechanical engineering student at Northeastern having the highest scholastic standing. The award is named in honor of Professor Ferretti, who retired June 30, 1961, after 43 years of service to the University.

The Harold D. Hodgkinson Achievement Awards

All Colleges

Established in 1954, the Harold D. Hodgkinson Achievement Awards of \$500 each are granted annually to a senior student in Division A and Division B. The winners of the awards are known as the Hodgkinson Scholars for the year in which they are chosen.

The award is based primarily upon distinguished scholastic achievement with due consideration of character, personality, qualities of leadership, cooperative work experience, military record, if any, and service in voluntary organizations and activities. Student leadership accomplishments and professional potential are evaluated in connection with these criteria.

The Hodgkinson Scholar is chosen by a committee of administrative members of the faculty. An appropriate certificate is presented to each recipient as a permanent record of his selection.

Kappa Delta Pi Award

Education

Kappa Delta Pi, the College of Education honor society, offers an annual award of \$100 to the education sophomore who, during the freshman year, achieved the highest scholastic record.

The Lilly Achievement Award

Pharmacy

The Lilly Achievement Award is given to a graduating senior for superior scholastic and professional achievement. Leadership qualities, professional attitudes, and academic performance will be considered in the selection of the individual for this award.

Julia and Merrill Robert Lovinger Award

All Colleges

This annual \$100 award was established in 1960 by William Lovinger for the purpose of giving assistance to a student of acceptable scholastic standing who can demonstrate financial need.

Robert Lubets Award

Business Administration

The award was established in 1953 by the Boston accounting firm of Robert Lubets & Company to recognize outstanding professional development and personal growth by students training for careers in accounting. One hundred dollars will be awarded to that degree candidate who at the completion of his junior year has demonstrated the greatest personal growth and professional development as evidenced by his improvement in scholastic achievement accompanied by professional aptitude indicative of future success as an accountant.

Harold A. Mock Award

Business Administration

Established in 1959 by Harold A. Mock, a distinguished alumnus of the University, this annual award of \$200 is made to an outstanding member of the junior class in the College of Business Administration. The Committee on Scholarship selects the recipient on the basis of high academic standing and cooperative work achievement, participation in University extracurricular activities, personality, and character.

Ruth E. Phalen Memorial Award Fund

All Colleges

This fund was established in 1959 by Thomas E. Phalen, Jr., a member of the faculty, in memory of his wife. The income from this fund is used yearly as a cash award to a senior, junior, or middler, preferably in the College of Engineering, who maintains at least a 2.0 academic average, shows outstanding ability in one or more varsity sports, and demonstrates excellent campus citizenship.

Roland Guyer Porter Memorial Fund

Electrical Engineering

This fund was established in 1953 by colleagues and friends of the late Professor Roland G. Porter, for many years head of the Department of Electrical Engineering. Interest from the fund provides an annual award to a student in the Department of Electrical Engineering who best exemplifies the qualities of mind and character which Professor Porter did so much to develop in his lifetime.

President's Awards

All Colleges

Since 1929, at the annual Honors Day Convocation, four awards of \$100 each, known as the President's Awards, have been presented to the students with the outstanding records in the sophomore, middler, junior and senior classes.

ROTC Awards**ROTC**

Awards totaling \$1,000 are available to ROTC cadets each year. The University offers nine \$50 awards annually. They are: one to the outstanding freshman cadet, four to sophomores (one in each division), two to middlers (one to each division), and two to juniors (one to each division).

Scabbard and Blade (the cadet officers' honorary society) offers four \$125 awards annually to middlers. The Pershing Rifles (the basic course honorary society) offers a \$50 award to a sophomore Pershing Rifles cadet.

Academic Achievement Awards are won by each cadet in the top 10 per cent of ROTC classes. This award, an embroidered wreath, is worn on the right sleeve of the uniform during the year immediately following. Leadership Achievement Awards, consisting of letters of commendation, are awarded to each cadet in the top 10 per cent in leadership potential.

Many medals and trophies are also awarded by other organizations to ROTC cadets for achievements in diverse fields.

Tau Beta Pi Award**Engineering**

Massachusetts Epsilon Chapter of Tau Beta Pi Association, national honorary society in engineering, offers annually a scholarship of \$100 to the sophomore in the College of Engineering who, during the previous year as a freshman, made the highest scholastic record.

Woman of the Year Award**All Colleges**

The women's societies of the University sponsor an annual scholarship of \$100 to the senior woman student who, by high scholastic attainment and by demonstration of the quality of leadership, has proven herself the outstanding woman student of the year.





College of Education

Frank E. Marsh, Jr., Dean

Thomas J. Cavanagh, Assistant Dean



General Objectives

The College of Education is increasingly and continuously concerned with the quality of those who teach. In the paragraphs that follow, quality is generally described and the several ways of assessing it are outlined.

Objective 1: Every teacher should learn the value of work.

All students will be expected to take the five-year cooperative program because the staff of the College of Education believes in a regularly patterned program of work experience. Such opportunities are provided in social agencies, libraries, hospitals, and in schools.

Objective 2: Every teacher should be broadly educated and should be an excellent example of American culture.

All students are expected to develop breadth in their program in two ways. First, students will be required to complete certain common course work, Social Science, United States History, American Literature, Public Speaking, Human Development, and English. Second, all students must complete a minimum of 16 credits in each of the following areas: Science and Mathematics, Humanities, and Social Sciences.

Objective 3: Every teacher should achieve an expertness in some field of knowledge.

Those preparing to teach at the secondary level must choose an academic major from among the following fields: Social Studies, English, Foreign Languages, General Science, Biology, Chemistry, Physics, Mathematics. Those preparing to teach at the elementary level must select an area major from among the following: Social Sciences, Humanities, Science and Mathematics, or Language-Reading. It is recommended that students have a field of concentration in mind before admission to the University since in most cases the choice will make a difference in their program for the freshman year.

Objective 4: Each teacher should be professionally prepared for the position of his choice.

In addition to their general education and specialized concentration, all students will share some common professional course work with related out-of-class experience and, in addition, will take course work appropriate to their level or field of teaching. Student teaching during the senior year will serve as an opportunity to apply what has been learned in the previous four years.

Students admitted as freshmen are enrolled in the Lower Division of the teacher education program. Thus they will have about two years to estimate their abilities to master college work, to discover the wisdom of their choice of a major field, and to evaluate the strength of their commitment to, and qualifications for, teaching.

Those desiring certification will make application to the Upper Division, preferably early in their second year, and will be expected to submit to a battery of tests and present such other evidence as the College of Education shall require. Evaluations will be made on intelligence, academic aptitude, verbal fluency, interest in working with young people, and emotional maturity.

A serious attempt will be made to assess these factors in their interrelationships rather than as isolated phenomena. Students accepted for the Upper Division standing will be expected to commit themselves to the remaining requirements of the program.

Students who are enrolled in other colleges of the university and who desire teacher certification will be expected to meet generally the requirements of all the above objectives.

Admission Requirements

Important to the future teacher is high ability in the communication skills and adequate strength in the field of special interest. As important as the pattern and quality of an applicant's preparation are the personal qualifications which contribute to success in teaching.

All applicants are expected to have completed the following subject-matter units:

Subject	Units
English (4 years)	3
Mathematics (minimum)	1
Science (minimum)	1
Other college preparatory subjects	6
Electives, not more than	4
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Students who wish to major in the Teaching of Science and Mathematics must be able to present these units:

*Algebra, through quadratics; Plane Geometry and Trigonometry	3½ units
Physics and Chemistry	2 units

*The full sequence of college preparatory Mathematics courses is strongly recommended.

It is desirable for students who wish to major in the Teaching of General Science to be able to present one unit in biology.

Transfers

Students desiring advanced standing from other institutions will not be accepted beyond the Lower Division unless they have, in general, completed the requirements for admission to the Upper Division, including appropriate course work, and the testing program. It is required that such students make application not later than May 1 to the Admissions Office of the University for advanced standing the following September.

GRADUATION REQUIREMENTS

Degrees

The College of Education will award the degree of Bachelor of Science in Education to those who successfully complete the program of preparation for teaching at elementary or secondary school level.

Quantitative Requirements

The required courses in each of the undergraduate curricula in the College of Education are indicated on the following pages. Each curriculum requires not less than 174 quarter hours of classwork, including one quarter of student teaching. At least 32 quarter hours will be required in Education, including student teaching.

Elective Courses

Elective courses, approved by the Dean of the College of Education, will be selected by the student from among courses in the Colleges of Liberal Arts and Business Administration.

Qualitative Requirements

Students in the College of Education will be expected to maintain an overall average of C while doing work of C+ or better in the field of specialization and in the professional sequence in order to be recommended for placement. Students are warned that any failure seriously handicaps their records and must be made up at the earliest opportunity.

Graduation with Honor

Candidates of distinctly superior achievement in their academic work will be graduated with honor. Upon special vote of the faculty a limited number of this group may be graduated with high honor or with highest honor. Students must have been in attendance at the University at least six quarters before they may become eligible for honors at graduation.

Cooperative Plan

Upon successfully completing thirty-six weeks of academic work, students in the College of Education are placed on the Cooperative Plan. In this program periods of classroom work alternate with a variety of work experiences in industry, social service agencies, community organizations, etc. This program, which has proved to be of inestimable value in offering students both the theoretical and practical aspects of a broad education, is consistent with the philosophy of the College of Education.

Opportunities are increasing steadily for selected students to participate as employees of cooperating school departments. Assisting in administrative as well as instructional functions, the student enjoys unique opportunity to acquire broad viewpoints and rich experience which will greatly enhance his confidence and effectiveness as a teacher.

National Teacher Examinations

All students who plan to make teaching their career will be expected to take the general and special National Teacher Examinations in their senior year.

Programs of Instruction

Students in the College of Education will find a variety of fields of specialization available. For secondary teaching, there are Biology, Chemistry, Physics, Earth Science, General Science, Mathematics, Social Studies, English, and Modern Languages. Those interested in elementary teaching must complete a broader type of major, in Social Science, Humanities, Science and Mathematics or Reading–Language. Those wishing Science and Mathematics will follow a program adapted from the General Science program. Specimen programs are shown on the pages that follow.

Accreditation

The programs offered by the College of Education are accredited by the National Council for Accreditation of Teacher Education. The College is a member of the American Association of Colleges for Teacher Education.

ADMINISTRATION DEPARTMENT
(EDUCATION)

William G. Zimmerman, Associate Professor and Chairman, B.S., M.Ed., Ed.D.

Assistant Professors

Robert S. Butters, B.A., M.Ed.
Carleton B. Lehmkuhl, B.S., M.S., Ph.D.
Philip J. Rushe, A.B., B.S., M.A.

This department offers graduate courses only. Consult Graduate Bulletin for course offerings.

COUNSELOR EDUCATION
(EDUCATION)

David R. Cook, Professor and Chairman, B.S., M.S., Ed.D.

Associate Professors

Robert W. Read, A.B., M.A.

Assistant Professors

Irvin Doress, A.B., M.A., Ed.D.
Thomas F. Harrington, B.A.,
M.Ed., Ph.D.

This department offers graduate courses only. Consult Graduate Bulletin for course offerings.

FOUNDATIONS DEPARTMENT
(EDUCATION)

E. Lawrence Durham, Professor and Chairman, A.B., M.A.

Professor

Arnold E. Hanson, Ph.B., Ph.M.,
Ph.D.

Assistant Professors

Ronald E. Baptiste, A.B., M.Ed.
H. Leslie Cramer, B.A., Ed.M.
Lionel P. Etscovitz, A.B., Ed.M.
Iris E. Fodor, B.A., M.A., Ph.D.
Ruth E. Harmon, LL.B., Ed.M.

Associate Professors

Wendell R. Brown, B.A., LL.B.,
D.S.S.
E. Vaughn Gulo, A.B., M.A., Ed.D.
Irene A. Nichols, B.S., M.Ed.,
Ed.D.
Alvin D. Zalinger, B.S.Ed., M.A.

INSTRUCTION DEPARTMENT
(EDUCATION)

George B. Rochfort, Associate Professor and
Acting Chairman, B.S., M.Ed., D.Ed.

Associate Professors

Mary J. Lee, B.A., Ed.M.
Robert C. McLean, Jr., A.B., M.S.,
Ed.D.

Assistant Professors

Thomas H. Clark, A.B., M.A.
Harold A. Miner, B.S., Ed.M.,
Ed.D.
Sandra M. Parker, B.A., Ed.M.
Guy A. Petralia, A.B., A.M., Ed.M.
Paul H. Tedesco, A.B., A.M.

READING DEPARTMENT
(EDUCATION)

Melvin E. Howards, Professor and
Chairman, B.S., M.A., Ph.D.

Associate Professor

Maurice Kaufman, B.S., M.S.,
Ph.D.

Assistant Professors

Nicholas J. Buffone, B.A., M.A.,
Ph.D.
Marjorie O. Burrill, B.S., Ed.M.
Donald S. Leeds, A.B., A.M.
John F. Maguire, A.B., Ed.M.
Michael E. Werle, B.S. in Ed.,
M.Ed.

Instructor

Leslie A. Burg, B.S., M.Ed.

REHABILITATION AND SPECIAL EDUCATION DEPARTMENT
(EDUCATION)

Reuben J. Margolin, Professor and Chairman, A.B., M.A., Ed.D.

Professors

Robert J. Ferullo, B.S., Ed.M.,
Ed.D.
Helen J. Kenney, A.B., Ed.M.
Ed.D.

Assistant Professor

Herbert Sonthoff, M.A., Dn.D.,
rer pol.

Instructors

Dorothy M. Aram, B.S., M.A.
Gilbert G. Neil, A.B.
Maureen S. O'Donnell, B.S., M.Ed.
Nancy E. Rosoff, B.S., Ed.M.

Associate Professors

George J. Goldin, B.S., M.S., Ph.D.
Alan B. Sostek, A.B., M.A., Ph.D.

Specimen Program in TEACHING OF EARTH SCIENCES

Each year an increasing number of secondary schools are introducing the relatively new curriculum in earth science. The program is characterized by a solid foundation in the basic sciences with depth in the geology area and breadth in the other areas of the earth sciences.

FIRST YEAR

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
10.101	Basic Math.	3 3	10.102	Basic Math.	3 3	10.103	Basic Math.	3 3
12.121	Gen.Chem.	3(3) 4	12.122	Gen. Chem.	3(3) 4	12.123	Gen. Chem.	3(3) 4
18.111	Gen. Biol.	2(3) 3	18.112	Gen. Biol.	2(3) 3	18.113	Gen. Biol.	2(3) 3
30.101	English	3 3	30.102	English	3 3	30.103	English	3 3
50.111	Soc. Science	3 3	50.112	Soc. Science	3 3	50.113	Soc. Science	3 3

SECOND YEAR

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
11.136	Basic Physics	3(3) 4	11.137	Basic Physics	3(3) 4
16.141	Phys. Geology	4 4	16.142	Hist. Geology	4 4
50.121	Human Dev. & Lrng. I	4 4	29.100	Pub. Speaking	3 3
	Elective	4 4		Elective	4 4

THIRD YEAR

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
16.---	Sci. Elective	4 4	16.---	Sci. Elective	4 4
23.210	U.S. to 1865	4 4	23.211	U.S. from 1865	4 4
	or			or	
30.180	Amer. Lit.	4 4	30.181	Amer. Lit.	4 4
50.131	Human Dev. & Lrng. II	4 4	51.135	Anal. Tchng. & Ed. Process	4 4
	Elective	4 4		Elective	4 4

FOURTH YEAR

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
16.---	Sci. Elective	4 4	16.---	Sci. Elective	4 4
23.210	U.S. to 1865	4 4	23.211	U.S. from 1865	4 4
	or			or	
30.180	Amer. Lit.	4 4	30.181	Amer. Lit.	4 4
51.147	M.&M.—Science	4 4	50.141	Meas. & Eval.	4 4
	Elective	4 4		Elective	4 4

FIFTH YEAR

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
16.---	Sci. Elective	4 4	16.175	Sem. Earth Sci.	4 4
50.151	Bkgds. Am. Ed.	4 4	16.---	Sci. Elective	4 4
90.253	Prof. Devel.	1 1			
	Electives	8 8			

Course descriptions are listed at the back of the catalog in numerical order.

Specimen Program in TEACHING OF ENGLISH

This program prepares English teachers for the junior or senior high school. It provides a basis for specialized graduate study in English as well as in education.

FIRST YEAR

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
16.106	Earth Sci.	3 3	16.107	Earth Sci.	3 3	16.108	Earth Sci.	3 3
22.101	Intr. Pol. Sci.	3 3	22.102	Intr. Pol. Sci.	3 3	22.103	Intr. Pol. Sci.	3 3
23.101	West. Civ.	3 3	23.102	West. Civ.	3 3	23.103	West. Civ.	3 3
30.101	English	3 3	30.102	English	3 3	30.103	English	3 3
50.111	Soc. Sci.	3 3	50.112	Soc. Sci.	3 3	50.113	Soc. Sci.	3 3

SECOND YEAR

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
23.130	England to 1688	4 4	23.131	England after 1688	4 4
30.170	English Literature	4 4	29.100	Public Speaking	3 3
39.115	Econ. Prin. & Prob.	4 4	30.171	English Literature	4 4
50.121	Human Dev. & Lrng. I	4 4	54.126	Sec. Reading	4 4

THIRD YEAR

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
23.210	U.S. to 1865	4 4	23.211	U.S. after 1865	4 4
30.120	Intr. Linguistics	4 4	30.121	Found. of Eng.	4 4
30.180	Amer. Literature	4 4	30.181	Amer. Literature	4 4
50.131	Human Dev. & Lrng. II	4 4	51.135	Anal. Tchng. & Ed. Process	4 4

FOURTH YEAR

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
30.124	Tradit. Grammar	4 4	30.125	Grammatical Anal.	4 4
30.250	Shakespeare	4 4	30.251	Shakespeare	4 4
51.143	M.&M.-English Science or Math. Elec.	4 4	50.141	Meas. & Eval. Sci. or Math. Elective	4 4

FIFTH YEAR

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
30.104	Intermed. Writing	4 4		Electives	8 8
50.151	Bkgrnds. Amer. Ed.	4 4			
	Electives	8 8			
90.253	Prof. Dev.	1 1			

Course descriptions are listed at the back of the catalog in numerical order.

**Specimen Program in
TEACHING OF GENERAL SCIENCE**

This program prepares students for the teaching of science at the junior high school level or in some curricula of the senior high school.

FIRST YEAR

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
10.101	Basic Math.	3 3	10.102	Basic Math.	3 3	10.103	Basic Math.	3 3
12.121	Gen. Chem.	3(3) 4	12.122	Gen. Chem.	3(3) 4	12.123	Gen. Chem.	3(3) 4
18.111	Gen. Biol.	2(3) 3	18.112	Gen. Biol.	2(3) 3	18.113	Gen. Biol.	2(3) 3
30.101	English	3 3	30.102	English	3 3	30.103	English	3 3
50.111	Soc. Science	3 3	50.112	Soc. Science	3 3	50.113	Soc. Science	3 3

SECOND YEAR

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
10.106	Calculus	4 4	10.107	Calculus	4 4
11.136	Basic Physics	3(3) 4	11.137	Basic Physics	3(3) 4
12.141	Org. Chem. I	3(3) 4	12.142	Organic Chem. II	3(3) 4
50.121	Human Dev. & Lrng. I	4 4	29.100	Public Speaking	3 3

THIRD YEAR

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
16.131	Oceanography I	4 4	16.132	Oceanography II	4 4
16.141	Prin. of Geology	4 4	16.161	Astronomy	4 4
23.210	U.S. to 1865	4 4	23.211	U.S. after 1865	4 4
50.131	Human Dev. & Lrng. II	4 4	51.135	Anal. Tchng., Ed. Process	4 4

FOURTH YEAR

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
18.158	Physiology I	4 4	18.159	Physiology II	4 4
30.180	Amer. Literature	4 4	30.181	Amer. Literature	4 4
51.147	M. & M.-Science Science Elective	4 4	50.141	Meas. & Eval. Science Elective	4 4

FIFTH YEAR

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
50.151	Bkgrnds. Amer. Ed.	4 4		Electives	8 8
	Electives	12 12			
90.253	Prof. Dev.	1 1			

Course descriptions are listed at the back of the catalog in numerical order.

Specimen Program in TEACHING OF MATHEMATICS

This program prepares Mathematics teachers for the junior or senior high school. It provides a basis for specialized graduate study in Mathematics as well as in education.

FIRST YEAR

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
10.201	Calculus	5	5	10.202	Calculus	5	5	10.203	Algebra	5	5
11.151	Physics	3	3	11.152	Physics	3	3	11.153	Physics	3	3
30.101	English	3	3	30.102	English	3	3	30.103	English	3	3
50.111	Soc. Sci.	3	3	50.112	Soc. Sci.	3	3	50.113	Soc. Sci.	3	3

SECOND YEAR

QUARTER 4				QUARTER 5			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
10.204	Calculus	4	4	10.205	Calculus	4	4
10.206	Algebra	4	4	10.208	Probabilities	4	4
50.121	Human Dev. & Lrng. I	4	4	29.100	Public Speaking	3	3
	Human. Elective	4	4	51.124	Mod. Math. Curric.	4	4

THIRD YEAR

QUARTER 6				QUARTER 7			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
10.220	Math. Statistics	4	4	10.225	Computers, Logic	4	4
26.150	Intro. Logic	4	4	26.151	Symbolic Logic	4	4
30.180	Amer. Literature	4	4	30.181	Amer. Literature	4	4
50.131	Human Dev. & Lrng. II	4	4	51.135	Anal. Tchng. & Ed. Process	4	4

FOURTH YEAR

QUARTER 8				QUARTER 9			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
*10.170	Geometry	4	4	*10.171	Geometry	4	4
	Math Elective	4	4		Math. Elective	4	4
51.145	M. & M.-Math. Elective	4	4	50.141	Meas. & Eval. Elective	4	4

FIFTH YEAR

QUARTER 10				QUARTER 11			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
*10.273	Hist. of Math.	4	4	*10.274	Number Theory	4	4
23.210	U.S. to 1865	4	4	23.211	U.S. after 1865	4	4
50.151	Bkgrnds. Amer. Ed.	4	4		Elective	4	4
	Elective	4	4				
90.253	Prof. Dev.	1	1				

*10.170, 10.171 and 10.273, 10.274 offered in alternate years. 10.170, 10.171 offered in 1968-69.

Course descriptions are listed at the back of the catalog in numerical order.

Specimen Program in TEACHING OF MODERN LANGUAGES

This program prepares students to teach foreign languages in the junior or senior high school. Two languages are required, to be chosen from French, German, Russian, or Spanish. Students in this major usually begin a new language in the freshman year and in the upper years continue the language they studied in high school and the new language begun in college. A total of 40 quarter hours in advanced language courses covering the two languages is required.

FIRST YEAR

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
16.106	Earth Science	3	3	16.107	Earth Science	3	3	16.108	Earth Science	3	3
23.101	West. Civ.	3	3	23.102	West. Civ.	3	3	23.103	West. Cult.	3	3
30.101	English	3	3	30.102	English	3	3	30.103	English	3	3
50.111	Soc. Science	3	3	50.112	Soc. Science	3	3	50.113	Soc. Science	3	3
	Modern Lang.	3	3		Modern Lang.	3	3		Modern Lang.	3	3

SECOND YEAR

QUARTER 4				QUARTER 5			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
23.210	U.S. to 1865	4	4	23.211	U.S. after 1865	4	4
39.115	Econ. Prin. & Prob.	4	4	29.100	Public Speaking	3	3
50.121	Human Dev. & Lrng. I	4	4	39.116	Econ. Prin. & Prob.	4	4
	Modern Lang.	4	4		Modern Lang.	4	4

THIRD YEAR

QUARTER 6				QUARTER 7			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
50.131	Human Devel. & Lrng. II	4	4	51.135	Anal. of Tchng.	4	4
	Mod. Lang. Elective	4	4		Mod. Lang. Elective	4	4
	Mod. Lang. Elective	4	4		Mod. Lang. Elective	4	4
	Science Elective	4	4		Science Elective	4	4

FOURTH YEAR

QUARTER 8				QUARTER 9			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
30.120	Intro. Linguistics	4	4	30.171	English Literature	4	4
30.170	English Literature	4	4	50.141	Meas. & Eval.	4	4
51.140	M. & M.-Mod. Lang.	4	4		Mod. Lang. Elective	4	4
	Mod. Lang. Elective	4	4		Mod. Lang. Elective	4	4

FIFTH YEAR

QUARTER 10				QUARTER 11			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
50.151	Bkgrnds. Amer. Ed.	4	4		Electives	8	8
	Mod. Lang. Elective	4	4				
	Mod. Lang. Elective	4	4				
	Elective	4	4				
90.253	Prof. Dev.	1	1				

Course descriptions are listed at the back of the catalog in numerical order.

Specimen Program in ELEMENTARY TEACHING — HUMANITIES

The Humanities area concentration should be chosen by those students who wish to equip themselves with special strengths in art or music or drama with a view to becoming a resource person in such areas in the elementary school.

FIRST YEAR

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
16.106	Earth Sci.	3 3	16.107	Earth Sci.	3 3	16.108	Earth Sci.	3 3
22.101	Intr. Pol. Sci.	3 3	22.102	Intr. Pol. Sci.	3 3	22.103	Intr. Pol. Sci.	3 3
23.101	West. Civ.	3 3	23.102	West. Civ.	3 3	23.103	West. Civ.	3 3
30.101	English	3 3	30.102	English	3 3	30.103	English	3 3
50.111	Soc. Sci.	3 3	50.112	Soc. Sci.	3 3	50.113	Soc. Sci.	3 3

SECOND YEAR

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
16.121	Nat. Hist. I	4 4	16.122	Nat. Hist. II	4 4
27.113	Creat. Draw.	(6) 4	29.100	Public Speaking	3 3
39.115	Econ. Prin. & Prob.	4 4		Elective	4 4
50.121	Hum. Dev. & Lrng. I	4 4		Human. Elective	4 4

THIRD YEAR

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
50.131	Hum. Dev. & Lrng. II	4 4	51.132	Fund. of Arith. II	4 4
51.131	Fund. of Arith. I	4 4	51.135	Anal. Tchng., Ed. Proc.	4 4
54.135	Elem. Reading I	4 4	54.136	Elem. Reading II	4 4
	Human. Elective	4 4		Human. Elective	4 4

FOURTH YEAR

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
23.210	U.S. to 1865	4 4	23.211	U.S. after 1865	4 4
51.141	Elem. Ed.		51.142	Elem. Ed.	
	Compend. I	4 4		Compend. II	4 4
	Elective	4 4	50.141	Meas. & Eval.	4 4
	Human. Elective	4 4		Art Elective	4 4

FIFTH YEAR

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
30.180	Amer. Literature	4 4	30.181	Amer. Literature	4 4
50.151	Bkgrnds.	4 4		Art Elective	4 4
	Amer. Ed.	4 4			
55.121	Intr. Spec. Ed.	4 4			
	Elective	4 4			
90.253	Prof. Dev.	1 1			

Course descriptions are listed at the back of the catalog in numerical order.

Specimen Program in ELEMENTARY TEACHING SCIENCE — MATHEMATICS

Students who have special interests and abilities in science or mathematics, but who want to teach on the elementary school level should choose this area concentration with a view to becoming the science or mathematics resource person in team teaching or similar situations.

FIRST YEAR

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
10.101	Basic Math.	3 3	10.102	Basic Math.	3 3	10.103	Basic Math.	3 3
16.106	Earth Sci.	3 3	16.107	Earth Sci.	3 3	16.108	Earth Sci.	3 3
23.101	West. Civ.	3 3	23.102	West. Civ.	3 3	23.103	West. Civ.	3 3
30.101	English	3 3	30.102	English	3 3	30.103	English	3 3
50.111	Soc. Sci.	3 3	50.112	Soc. Sci.	3 3	50.113	Soc. Sci.	3 3

SECOND YEAR

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
12.135	Gen. Chem.	3(3) 4	12.136	Gen. Chem.	3(3) 4
16.121	Nat. Hist. I	4 4	16.122	Nat. History II	4 4
39.115	Econ. Prin. & Prob.	4 4	29.100	Public Speaking	3 3
50.121	Human Dev. & Lrng. I	4 4		Human. Elective	4 4

THIRD YEAR

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
11.136	Basic Physics	3(3) 4	11.137	Basic Physics	3(3) 4
50.131	Human Dev. & Lrng. II	4 4	51.132	Fund. of Arith II	4 4
51.131	Fund. of Arith. I	4 4	51.135	Anal. Tchng. & Ed. Proc.	4 4
54.135	Elem. Reading I	4 4	54.136	Elem. Reading II	4 4

FOURTH YEAR

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
16.131	Oceanography I	4 4	16.132	Oceanography II	4 4
16.141	Prin. of Geology	4 4	23.211	U.S. after 1865	4 4
23.210	U.S. to 1865	4 4	50.141	Meas. & Eval.	4 4
51.141	Elem. Ed. Compend. I	4 4	51.142	Elem. Ed. Compend. II	4 4

FIFTH YEAR

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
30.181	Amer. Literature I	4 4	26.133	Philos. Sci.	4 4
50.151	Bkgrnds. Amer. Ed.	4 4	30.181	Amer. Literature II	4 4
55.121	Int. Spec. Ed.	4 4			
90.253	Prof. Dev. Human. Elective	1 1 4 4			

Course descriptions are listed at the back of the catalog in numerical order.

Specimen Program in ELEMENTARY TEACHING SOCIAL SCIENCE

This area concentration should be chosen by students whose special interests are in history, government, geography, anthropology, and sociology, with a view to becoming a resource person in such areas in the elementary school.

FIRST YEAR

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
16.106	Earth Sci.	3	3	16.107	Earth Sci.	3	3	16.108	Earth Sci.	3	3
22.101	Intr. Pol. Sci.	3	3	22.102	Intr. Pol. Sci.	3	3	22.103	Intr. Pol. Sci.	3	3
23.101	West. Civ.	3	3	23.102	West. Civ.	3	3	23.103	West. Civ.	3	3
30.101	English	3	3	30.102	English	3	3	30.103	English	3	3
50.111	Soc. Science	3	3	50.112	Soc. Science	3	3	50.113	Soc. Science	3	3

SECOND YEAR

QUARTER 4				QUARTER 4			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
16.121	Nat. History I	4	4	16.122	Nat. History II	4	4
23.210	U.S. to 1865	4	4	23.211	U.S. after 1865	4	4
39.115	Econ. Prin. & Prob.	4	4	29.100	Public Speaking	3	3
50.121	Human Dev. & Lrng. I	4	4		Human. Elective	4	4

THIRD YEAR

QUARTER 6				QUARTER 7			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
50.131	Human Dev. & Lrng. II	4	4	51.132	Fund. of Arith. II	4	4
51.131	Fund. of Arith. I	4	4	51.135	Anal. Tchng. & Ed. Proc.	4	4
54.135	Elem. Reading I	4	4	54.136	Elem. Reading II	4	4
	History Elective	4	4		History Elective	4	4

FOURTH YEAR

QUARTER 8				QUARTER 9			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
22.151	Comp. Govt.	4	4	22.131	Amer. Govt.	4	4
30.180	Amer. Literature	4	4	30.181	Amer. Literature	4	4
54.141	Elem. Ed.	4	4	50.141	Meas. & Eval.	4	4
	Compend. I	4	4	51.142	Elem. Ed. Compend. II	4	4
	History Elective	4	4				

FIFTH YEAR

QUARTER 10				QUARTER 11			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
50.151	Bkgrnds Amer. Ed.	4	4		Elective	4	4
55.121	Intr. Spec. Ed.	4	4		Human. Elective	4	4
	Elective	4	4				
90.253	Prof. Dev.	1	1				
	Human. Elective	4	4				

Course descriptions are listed at the back of the catalog in numerical order.

Specimen Program in
ELEMENTARY TEACHING
LANGUAGE-READING

This area concentration is recommended to those students who wish to become language arts and reading specialists in the elementary school and who are planning on graduate study in these areas.

FIRST YEAR

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
16.106	Earth Sci.	3	3	16.107	Earth Sci.	3	3	16.108	Earth Sci.	3	3
23.101	West. Civ.	3	3	23.102	West. Civ.	3	3	23.103	West. Civ.	3	3
30.101	English	3	3	30.102	English	3	3	30.103	English	3	3
50.111	Soc. Sci.	3	3	50.112	Soc. Sci.	3	3	50.113	Soc. Sci.	3	3
	Mod. Lang.	3	3		Mod. Lang.	3	3		Mod. Lang.	3	3

SECOND YEAR

QUARTER 4				QUARTER 5			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
16.121	Nat. History I	4	4	16.122	Nat. History II	4	4
39.115	Econ. Prin. & Prob.	4	4	29.100	Public Speaking	3	3
50.121	Human Dev. & Lrng. I	4	4		Modern Lang.	4	4
	Modern Lang. or Human. Elective	4	4		or Human. Elective	4	4
		4	4		Elective	4	4

THIRD YEAR

QUARTER 6				QUARTER 7			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
30.120	Intro. Linguistics	4	4	30.121	Found. of Eng.	4	4
50.131	Human Dev. & Lrng. II	4	4	51.132	Fund. of Arith. II	4	4
51.131	Fund. of Arith. I	4	4	51.135	Anal. Tchng., Ed. Proc.	4	4
54.135	Elem. Reading I	4	4	54.136	Elem. Reading II	4	4

FOURTH YEAR

QUARTER 8				QUARTER 9			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
30.124	Tradit. Grammar	4	4	30.125	Grammatical Anal.	4	4
51.141	Elem. Ed. Compend. I	4	4	50.141	Meas. & Eval.	4	4
54.141	Remedial Reading	4	4	51.142	Elem. Ed. Compend. II	4	4
55.131	Dynamics of Speech & Lang. Dev.	4	4	54.142	Linguistics & Reading	4	4

FIFTH YEAR

QUARTER 10				QUARTER 11			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
23.210	U.S. to 1865	4	4	23.211	U.S. after 1865	4	4
30.180	Amer. Literature I	4	4	30.181	Amer. Literature II	4	4
50.151	Bkgrnds. Amer. Ed.	4	4				
54.151	Children's Lit.	4	4				
90.253	Prof. Dev.	1	1				

Course descriptions are listed at the back of the catalog in numerical order.

Specimen Program in TEACHING OF BIOLOGY

This program prepares Biology teachers for the junior or senior high school. It provides a basis for specialized graduate study in Biology as well as in Education.

FIRST YEAR

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
10.101	Basic Math.	3	3	10.102	Basic Math.	3	3	10.103	Basic Math.	3	3
12.121	Chemistry	3(3)	4	12.122	Chemistry	3(3)	4	12.123	Chemistry	3(3)	4
18.111	Gen. Biol.	2(3)	3	18.112	Gen. Biol.	2(3)	3	18.113	Gen. Biol.	2(3)	3
30.101	English	3	3	30.102	English	3	3	30.103	English	3	3
50.111	Soc. Sci.	3	3	50.112	Soc. Sci.	3	3	50.113	Soc. Sci.	3	3

SECOND YEAR

QUARTER 4				QUARTER 5			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
12.141	Organic Chem.	3(3)	4	12.142	Organic Chem.	3(3)	4
18.150	Comp. Vert. Anat.	3(6)	5	18.155	Dev. Anat.	3(6)	5
23.210	U.S. to 1865	4	4	23.211	U.S. after 1865	4	4
50.121	Human. Dev. I	4	4	29.100	Public Speaking	3	3

THIRD YEAR

QUARTER 6				QUARTER 7			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
11.136	Basic Physics	3(3)	4	11.137	Basic Physics	3(3)	4
18.210	Inv. Zoology	3(6)	5	18.200	Genetics	3(3)	4
50.131	Human. Dev. II	4	4	51.135	Anal. Tchng.	4	4
	Biology Elective	4	4		Biology Elective	4	4

FOURTH YEAR

QUARTER 8				QUARTER 9			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
51.47	M. & M. Science	4	4	50.141	Meas. & Eval.	4	4
	Biology Elective	4	4		Biology Elective	4	4
	Human. Elective	4	4	26.133	Philos. of Sci.	4	4
	Elective	4	4		Human. Elective	4	4

FIFTH YEAR

QUARTER 10				QUARTER 11			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
18.258	Physiology	3(3)	4	18.259	Cell Physiology	3(3)	4
30.180	Amer. Lit. I	4	4	30.181	Amer. Lit. II	4	4
50.151	Bkgrnds.						
	Amer. Ed.	4	4				
	Biology Elective	4	4				
90.253	Prof. Dev.	1	1				

Course descriptions are listed at the back of the catalog in numerical order.

Specimen Program in
TEACHING OF CHEMISTRY

This program prepares Chemistry teachers for the senior high school. It provides a basis for specialized graduate study in Chemistry as well as in Education.

FIRST YEAR

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
10.111	Calculus	3 3	10.112	Calculus	3 3	10.113	Calculus	3 3
12.131	Chemistry	3(3) 4	12.132	Chemistry	3(3) 4	12.133	Chemistry	3(6) 5
18.111	Gen. Biol.	2(3) 3	18.112	Gen. Biol.	2(3) 3	18.113	Gen. Biol.	2(3) 3
30.101	English	3 3	30.102	English	3 3	30.103	English	3 3
50.111	Soc. Sci.	3 3	50.112	Soc. Sci.	3 3	50.113	Soc. Sci.	3 3

SECOND YEAR

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
10.144	Calculus	4 4	10.145	Calculus	4 4
11.120	Physics	4(4) 5	11.121	Physics	4(4) 5
12.153	Organic Chem.	3(3) 4	12.154	Organic Chem.	3(3) 4
50.121	Human Dev. & Lrng. I	4 4	29.100	Public Speaking	3 3

THIRD YEAR

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
12.155	Organic Chem.	3(6) 5	12.162	Physical Chem.	4(3) 5
12.161	Physical Chem.	4(3) 5	12.176	Analytical Chem.	4 4
23.210	U.S. to 1865	4 4	23.211	U.S. after 1865	4 4
50.131	Human Dev. & Lrng. II	4 4	51.135	Anal. Tchng. & Ed. Proc.	4 4

FOURTH YEAR

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
12.163	Physical Chem.	3(3) 4	12.178	Analytical Chem.	1(6) 3
12.177	Analytical Chem.	3(6) 5	50.141	Meas. & Eval.	4 4
51.147	M. & M. Science	4 4		Human. Elective	4 4
	Human. Elective	4 4		Elective	4 4

FIFTH YEAR

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
50.151	Bkgrnds.			Chem. Elective	4 4
	Amer. Ed.	4 4		Elective	4 4
	Chem. Elective	4 4			
	Electives	8 8			
90.253	Prof. Dev.	1 1			

Course descriptions are listed at the back of the catalog in numerical order.

Specimen Program in TEACHING OF PHYSICS

This program prepares Physics teachers for the senior high school. It provides a basis for specialized graduate study in Physics as well as in Education.

FIRST YEAR

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
10.201	Calculus	5	5	10.202	Calculus	5	5	10.203	Algebra	5	5
11.151	Physics	3	3	11.152	Physics	3	3	11.153	Physics	3	3
30.101	English	3	3	30.102	English	3	3	30.103	English	3	3
50.111	Soc. Sci.	3	3	50.112	Soc. Sci.	3	3	50.113	Soc. Sci.	3	3

SECOND YEAR

QUARTER 4				QUARTER 5			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
10.204	Calculus	4	4	10.205	Calculus	4	4
11.154	Physics	4	4	11.155	Physics	4	4
11.164	Physics Lab.	(3)	1	11.165	Physics Lab.	(3)	1
50.121	Human Dev. & Lrng. I	4	4	29.100	Public Speaking	3	3
	Elective	4	4		Elective	4	4

THIRD YEAR

QUARTER 6				QUARTER 7			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
10.251	Analysis	4	4	10.252	Analysis	4	4
11.200	Mechanics I	4	4	11.201	Mechanics II	4	4
11.260	Wave Lab.	2(3)	3	11.261	Exp. Lab.	1(3)	2
50.131	Human Dev. & Lrng. II	4	4	51.135	Anal. Tchng. & Ed. Process	4	4
					Elective	4	4

FOURTH YEAR

QUARTER 8				QUARTER 9			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
11.220	Thermo. & Kin. Theory	4	4	11.230	Mod. Physics	4	4
12.135	Gen. Chemistry	3(3)	4	12.136	Gen. Chemistry	3(3)	4
23.210	U.S. to 1865	4	4	23.211	U.S. after 1865	4	4
51.147	M. & M. Science	4	4	50.141	Meas. & Eval.	4	4

FIFTH YEAR

QUARTER 10				QUARTER 11			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
30.180	Amer. Literature	4	4	30.181	Amer. Literature	4	4
50.151	Bkgrnds.				Physics Elective	4	4
	Amer. Ed.	4	4		Human. Elective	4	4
	Physics Elective	4	4				
	Human. Elective	4	4				
90.253	Prof. Dev.	1	1				

Course descriptions are listed at the back of the catalog in numerical order.

Specimen Program in TEACHING OF SOCIAL STUDIES

This program prepares Social Studies teachers for the junior or senior high school.

FIRST YEAR

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
16.106	Earth Sci. I	3	3	16.107	Earth Sci. II	3	3	16.108	Earth Sci. III	3	3
22.101	Intr. Pol. Sci.	3	3	22.102	Intr. Pol. Sci.	3	3	22.103	Intr. Pol. Sci.	3	3
23.101	West. Civ.	3	3	23.102	West. Civ.	3	3	23.103	West. Civ.	3	3
30.101	English	3	3	30.102	English	3	3	30.103	English	3	3
50.111	Soc. Science	3	3	50.112	Soc. Science	3	3	50.113	Soc. Science	3	3

SECOND YEAR

QUARTER 4				QUARTER 5			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
23.210	U.S. to 1865	4	4	23.211	U.S. after 1865	4	4
26.150	Intro. Logic	4	4	29.100	Public Speaking	3	3
39.115	Econ. Prin. & Prob.	4	4	39.116	Econ. Prin. & Prob.	4	4
50.121	Human Dev. & Lrng. I	4	4	54.126	Sec. Reading	4	4

THIRD YEAR

QUARTER 6				QUARTER 7			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
23.125	Modern Europe	4	4	22.131	Amer. Govt.	4	4
23.199	Historian's Craft	4	4	30.181	Amer. Literature	4	4
30.180	Amer. Literature	4	4	39.280	Comp. Econ. Syst.	4	4
50.131	Human Dev. & Lrng. II	4	4	51.135	Anal. Tchng. & Ed. Process	4	4

FOURTH YEAR

QUARTER 8				QUARTER 9			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
22.221	Internat. Relations	4	4	50.141	Meas. & Eval. Pol. Sci. Elec.	4	4
51.149	M. & M. Social Stud.	4	4		Human. Elective	4	4
	History Elective	4	4		History Elective	4	4
	Human. Elective	4	4				

FIFTH YEAR

QUARTER 10				QUARTER 11			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
22.271	Political Theory	4	4		History Elective	4	4
50.151	Bkgrnds. Amer. Ed.	4	4		Sci./Math. Elective	4	4
	History Elective	4	4				
	Sci.-Math. Elective	4	4				
90.253	Prof. Dev.	1	1				

Course descriptions are listed at the back of the catalog in numerical order.

Specimen Program in SPEECH AND HEARING THERAPY

This is a highly specialized program preparing students for employment in public or private schools as speech and hearing therapists or for graduate study in the field of Speech Pathology and Audiology.

FIRST YEAR

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
16.106	Earth Sci. I	3	3	16.107	Earth Sci. II	3	3	16.108	Earth Sci. III	3	3
22.101	Intr. Pol. Sci.	3	3	22.102	Intr. Pol. Sci.	3	3	22.103	Intr. Pol. Sci.	3	3
23.101	West. Civ.	3	3	23.102	West. Civ.	3	3	23.103	West. Civ.	3	3
30.101	English	3	3	30.102	English	3	3	30.103	English	3	3
50.111	Soc. Sci.	3	3	50.112	Soc. Sci.	3	3	50.113	Soc. Sci.	3	3

SECOND YEAR

QUARTER 4				QUARTER 5			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
23.210	U.S. to 1865	4	4	23.211	U.S. after 1865	4	4
39.115	Econ. Prin. & Prob.	4	4	55.122	Intr. Spch. & Hrng. Ther.	4	4
50.121	Human Dev. & Lrng. I	4	4	55.124	Anat Sp. & Hrg. Communic.	4	4
55.121	Intr. Spec. Ed.	4	4	55.126	Skills	4	4

THIRD YEAR

QUARTER 6				QUARTER 7			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
50.131	Human Dev. & Lrng. II	4	4	19.135	Psych. Personality	4	4
54.135	Elem. Reading I	4	4	51.135	Anal. Tchng. & Ed. Process	4	4
55.131	Dyn. of Spch. & Lang. Dev.	4	4	55.134	Organic Sp. Disorders	4	4
55.133	Intro. Ling. & Phonetics	4	4		Human. Elective	4	4

FOURTH YEAR

QUARTER 8				QUARTER 9			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
30.180	Amer. Literature	4	4	30.181	Amer. Literature	4	4
55.141	M.&M. in Speech	4	4	50.141	Meas. & Eval.	4	4
55.143	Diagnosis Sp. & Hrg.	4	4	55.142	Intr. Audiology	4	4
55.145	Func. Sp. Disorders	4	4	55.144	Clinical Prac. I	2(6)	4

FIFTH YEAR

QUARTER 10				QUARTER 11			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
50.151	Bkgrnds. Amer. Ed.	4	4	55.152	Speech Reading & Audit Training	4	4
55.155	Clinical Prac. II Human. Elective Sci. or Math.	2(6)	4	55.154	Intr. Stutt.	4	4
	Elective	4	4				
90.253	Prof. Dev.	1	1				

Course descriptions are listed at the back of the catalog in numerical order.





College of Liberal Arts

Robert A. Shepard, Dean

Sidney Herman, Assistant Dean



Aims

The College of Liberal Arts seeks to guide young men and women toward intellectual maturity. The mature person is aware of the significant phenomena of the world and has the ability to cope with them effectively and creatively.

To help the student understand the conditions of man's existence, the College of Liberal Arts requires him to study ideas and experiences that are the subject matter of a variety of disciplines. To prepare him to play an effective role in the world, a departmental curriculum helps him to master the concepts and methods of a specific discipline. Detailed study of an academic field is essential to liberal education, for only through specialization can a student acquire insight into the intellectual processes which form the basis of all knowledge. Broader study is equally necessary, for only through a variety of inquiries can a student gain perspective about himself as an individual and about the relevance of his knowledge to society.

Northeastern University's Cooperative Plan contributes to a liberal education by providing valuable opportunities for the student to test and extend his understanding of the complex world and of his special field through direct experience and practical application.

At best, however, the brevity of his own undergraduate experience and the vastness of human experience permit the student only to start, not to complete, his education. Moreover, education is an unending process because man's understanding of the world continually changes and grows. Consequently, the most enduring contribution a college of liberal arts can make is to help the individual acquire the skill and motivation to continue his intellectual development throughout his life.

Methods

To enable each student to plan a college program in keeping with his own interests and aptitudes, a wide range of courses is offered. This does not mean that students are free to elect courses indiscriminately, for if they are to obtain a liberal education they must have training in several basic fields. Therefore, a definite series of basic courses in each curriculum is required by the faculty. These requirements are largely concentrated in the first two years of the curriculum.

Through a comprehensive guidance program students are directed in their selection of courses so that they obtain the proper preparation for their intended vocations. Specialization in a major field is emphasized during the latter part of the curriculum and is facilitated by the opportunity for electing certain courses in the other Basic Colleges of the University.

*Through the Northeastern plan of cooperative education for upperclassmen, the student makes early contact with actual working conditions and profits by the wholesome experience of earning at least part of his or her college expenses. *Viewed as a whole, then, the college years surround the student with an environment very close to that which he or she will enter after graduation. The curricula in the College of Liberal Arts afford not only a broad cultural training and intensive academic preparation but also the necessary foundation for a wide range of vocations.

*The College of Liberal Arts offers each of its students in all majors except Chemistry and Medical Technology the choice of the five-year cooperative work program and a four-year full-time program.

*The full-time program allows students, whose goal is graduate training, to complete their undergraduate education in four years.

Admission Requirements

The College of Liberal Arts offers three broad areas of study. Since the freshman-year program is different in each of these areas, entrance requirements also vary.

All curricula:

Subject	Units
English (4 years)	3
Modern language (at least 2 years)	2
Mathematics (at least 1 year)	1
Science (at least 1 year)	1
Other college preparatory subjects	4
Electives, not more than	4
	<hr/> 15

The following curricula must include these mathematics and science units:

Biology — Chemistry curricula (including Medical Technology, Premedical, and Pre dental programs)

Algebra, through quadratics, and Plane Geometry	3 units
Biology and Chemistry	2 units

Science curricula (Physics and Mathematics)

Applicants are required to show particular strength in mathematics through the full sequence of college preparatory courses. In addition, the successful completion of physics is required.

GRADUATION REQUIREMENTS

Degrees

The College of Liberal Arts awards the Bachelor of Arts degree to qualified candidates who have completed any one of the curricula offered.

Quantitative Requirements

Candidates for a degree must have completed one of the curricula listed on pages 15-16 and in their required and elective courses must complete at least 16 quarter hours of work in each of the following areas:

- | | |
|----------------------------|--|
| I. Science and Mathematics | Biology, Chemistry, Geology, Mathematics, Natural Science, Physics, or Psychology (laboratory courses). |
| II. Humanities | Art, Drama, Literature and Languages (excluding freshman English and elementary language), Philosophy, Speech, or Music. |
| III. Social Sciences | Economics, History, Political Science (except for freshmen Western Civilization and Political Science), Psychology, or Sociology-Anthropology. |

All candidates for a degree must have satisfactorily completed in college one year of a modern language above the elementary level.

Students who undertake cooperative work assignments must meet the requirements of the Department of Cooperative Education before they become eligible for their degrees.

The final three quarters immediately preceding graduation must be completed in residence at Northeastern.

A total of 175 quarter hours are required for the degree of which two quarter hours must be in Physical Education.

Qualitative Requirements

An average grade of C is required for graduation.

Graduation with Honor

Candidates of distinctly superior achievement in their academic work will be graduated with honor. Upon special vote of the faculty a limited number of this group may be graduated with high honor or with highest honor. Students must have been in attendance at the University at least six quarters before they may become eligible for honors at graduation.

Curricular Requirements

The required courses in each curriculum are indicated on the following pages. Upon petition to the faculty, substitutions may be permitted in exceptional cases when required by the specific vocational objective of the student.

During the last year students in all curricula may take 90.251 Placement Techniques, designed to prepare them for placement in specific positions in their chosen vocational field. Under expert guidance each student prepares a complete personnel record, studies himself or herself and the opportunities that are open, and works out a complete campaign for obtaining after-graduation employment.

Combined Program with Professional Schools

Students who have completed at least three-quarters of the work required for the baccalaureate degree at Northeastern University before entering an approved professional school of dentistry, law, or medicine, will be granted the Bachelor of Arts degree at the end of the second year in professional school, provided at least two-thirds of the work for the baccalaureate degree has been earned in residence at Northeastern and all other graduation requirements have been fulfilled. The residence requirement at Northeastern University must have been completed immediately prior to entrance into the professional school. Under this plan preprofessional students may reduce by one year the time ordinarily required for obtaining both degrees.

Four-Year Plan

All curricula in the College of Liberal Arts are normally organized on the five-year Cooperative Plan, which is the distinctive feature of Northeastern University.

However, in all majors except Chemistry and Medical Technology, qualified students may be excused from the Cooperative Plan by the Academic Standing Committee and may complete the requirements for the degree in four years.

Honors Program

An upperclass honors program is provided in the College of Liberal Arts to enable superior students to develop their potential to the highest degree by making it possible for them to pursue studies in their major fields to greater depth than is possible in the regular courses.

The nature of the program is determined by the academic department concerned. Programs may involve any of the following elements: special research projects culminating in honor theses, honor seminars, reading projects, directed independent study, or creative work. Flexibility is the keynote, with every consideration being given to the individual needs and requirements of the student.

The program is open to junior and senior students approved by the Faculty Honors Committee. To be eligible a student must have a grade-point average of 3.0 with no grade below B in all courses in the major field after the freshman year. The latter requirement may be waived by the Honors Committee on recommendation of the Department Chairman in exceptional cases.

AFFILIATED PROGRAMS

FOR DENTAL HYGIENISTS

The Forsyth School for Dental Hygienists conducts a two-year program of dental hygiene education and general education in cooperation with Northeastern University. Graduates of the program receive the Certificate in Dental Hygiene from Forsyth and the degree of Associate in Science from Northeastern.

FOR MEDICAL TECHNOLOGISTS

In cooperation with the New England Baptist and the New England Deaconess Hospitals, Northeastern University offers a full-time day program on the Cooperative Plan leading to the degree of Bachelor of Arts.

FOR NURSES

Northeastern University offers instruction in the sciences, humanities, and social studies for student nurses from the New England Deaconess and Children's Hospital Medical Center Schools of Nursing.

Biology Department

Francis D. Crisley, Professor and Chairman, Ph.D.

Professors

Fred A. Barkley, Ph.D.
Charles Gainor, Ph.D.
Charles M. Goolsby, Ph.D.
Abdul Karim Khudairi, Ph.D.
Nathan W. Riser, Ph.D.

Assistant Professors

David H. Ahlberg, A.B.
Britta L. Karlsson, B.S., M.T.
(ASCP)
Patricia Morse, Ph.D.
Samuel E. Moyer, Ph.D.

Associate Professors

Janis Z. Gabliks, D.D.S., M.S.,
Ph.D.
Fred A. Rosenberg, B.A., Ph.D.
Henry O. Werntz, B.S., Ph.D.
Joseph V. Pearincott, Ph.D.

Lecturers

Dade T. Curtis, M.A.
Shafiq Shukri, ABMS

Visiting Assistant Professor

Gordon Blanchard, Ph.D.

Biological scientists today study all phases of the world of living things from microbes to men. Among the members of the biology faculty are specialists in the study of plants (botany), animals (zoology), and microorganisms (microbiology). Among the other specialties represented are the study of the environment of living things (ecology), their life processes and activities (physiology), and the mechanisms of inheritance (genetics). The department attempts to present a balanced program of biology ranging from the study of communities of organisms down to the molecular level.

By majoring in biology a student can also prepare for many different occupations in the biological sciences, and for dentistry, medicine, or teaching.

Specimen Program in BIOLOGY

FIRST YEAR

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
18.111	Gen. Biology	2(3)	3	18.112	Gen. Biology	2(3)	3	18.113	Gen. Biology	2(3)	3
30.101	English	3	3	30.102	English	3	3	30.103	English	3	3
10.101	Basic Math.			10.102	Basic Math.	3	3	10.103	Basic Math.	3	3
	or				or				or		
10.111	Calculus	3	3	10.112	Calculus	3	3	10.113	Calculus	3	3
12.121	Gen. Chem.	3(3)	4	12.122	Gen. Chem.	3(3)	4	12.123	Gen. Chem.	3(3)	4
	or				or				or		
12.131	Gen. Chem.	3(3)	4	12.132	Gen. Chem.	3(3)	4	12.133	Gen. Chem.	3(6)	5
	Mod. Lang.	3	3		Mod. Lang.	3	3		Mod. Lang.	3	3

SECOND YEAR

QUARTER 4				QUARTER 5			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
12.141	Org. Chem. I	3(3)	4	12.142	Org. Chem. II	3(3)	4
18.150	Comp. Vert.			18.155	Dev. Anatomy	3(6)	5
	Anatomy	3(6)	5	21.100	Prin. Soc.	4	4
20.100	Prin. Soc. Anthr.	4	4		or		
	or			26.102	Intr. Phil. II	4	4
26.101	Intr. Phil. I	4	4		Mod. Lang.	4	4
	Mod. Lang.	4	4		or		
	or				Elective	4	4
	Elective	4	4				

THIRD YEAR

QUARTER 6				QUARTER 7			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
11.130	Gen. Physics	4	4	18.200	Genetics	3(3)	4
12.143	Org. Chem. III	3(3)	4		Elective	4	4
18.210	Invert. Zoology	3(6)	5		Elective	4	4
	Elective		4		Elective		4

FOURTH YEAR

QUARTER 8				QUARTER 9			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
11.131	Gen. Physics	3(3)	4	11.132	Gen. Physics	3(3)	4
12.171	Anal. Chem.	3(3)	4		Biology Elective		4
	Biology Elective	4	4		Elective	4	4
	Elective		*		Elective		*

FIFTH YEAR

QUARTER 10				QUARTER 11			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
18.258	Cell. Physiol.	3(3)	4	18.259	Cell. Physiol.	3(3)	4
	Biology Elective	4	4		Biology Elective		4
	Elective	4	4		Elective	4	4
	Elective		4		Elective		4

Specimen Program in
MEDICAL TECHNOLOGY

FIRST YEAR

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
10.101	Basic Math.	3	3	10.102	Basic Math.	3	3	10.103	Basic Math.	3	3
10.111	or Calculus	3	3	10.112	or Calculus	3	3	10.113	or Calculus	3	3
12.121	Gen. Chem.	3(3)	4	12.122	Gen. Chem.	3(3)	4	12.123	Gen. Chem.	3(3)	4
12.131	or Gen. Chem.	3(3)	4	12.132	or Gen. Chem.	3(3)	4	12.133	or Gen. Chem.	3(6)	5
18.111	Gen. Biol.	2(3)	3	18.112	Gen. Biol.	2(3)	3	18.113	Gen. Biol.	2(3)	3
30.101	English	3	3	30.102	English	3	3	30.103	English	3	3
	Mod. Lang.	3	3		Mod. Lang.	3	3		Mod. Lang.	3	3

SECOND YEAR

QUARTER 4				QUARTER 5			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
12.141	Org. Chem.	3(3)	4	12.142	Org. Chem.	3(3)	4
18.140	Hematology	3(3)	4	18.120	Basic Microbiol.	3(4)	4
20.100	Prin. Soc. Anthr.	4	4	21.100	Prin. Soc.	4	4
26.101	or Intr. Phil. I	4	4	26.102	or Intr. Phil. II	4	4
	Mod. Lang.	4	4		Mod. Lang.	4	4
	or Elective	4	4		or Elective	4	4

THIRD YEAR

QUARTER 6				QUARTER 7			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
11.130	Gen. Physics	4	4	18.200	Genetics	3(3)	4
12.143	Org. Chem.	3(3)	4	18.225	Animal Histol.	2(3)	3
18.150	Comp. Vert.				Biology Elec.		4
	Anat.	3(6)	5		Elective		4
	Elective		4				

FOURTH YEAR

QUARTER 8				QUARTER 9			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
11.131	Gen. Physics	3(3)	4	11.132	Gen. Physics	3(3)	4
12.171	Anal. Chem.	3(3)	4		Biology Elec.		4
18.226	Animal Histol.	2(3)	3		Electives		8
	Elective		4				

FIFTH YEAR

QUARTER 10				QUARTER 11			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
18.258	Cell Physiol.	3(3)	4	18.259	Cell Physiol.	3(3)	4
	Biology Elec.		4		Electives		12
	Electives		8				

Chemistry Department

William E. Cass, Associate Professor and Acting Chairman, Ph.B., Ph.D.

Professors

W. Fay Luder, A.B., Ph.D.
 Alfred Viola, B.A., M.A., Ph.D.
 Karl H. Weiss, B.S., Ph.D.
 Saverio Zuffanti, B.S., M.A.

Associate Professors (continued)

Barry L. Karger, S.B., Ph.D.
 Harold Naidus, A.B., M.S., Ph.D.
 John L. Roebber, A.B., Ph.D.
 Robert L. Stern, A.B., M.A., Ph.D.
 Robert N. Wiener, A.B., M.S., Ph.D.

Associate Professors

Fletcher S. Boig, S.B., M.S., Ed.M.
 Michael J. Eitel, B.S., Ph.D.
 William F. Holton, B.S., M.S., Ph.D.
 David M. Howell, B.S., M.S., Ph.D.
 Conrad M. Jankowski, B.S., M.S.,
 Ph.D.
 Elmer E. Jones, Ph.D., S.B., Ph.D.

Assistant Professors

Darryl D. DesMarteau, B.S., Ph.D.
 Joseph D. Gresser, B.S., Ph.D.
 Efthalia J. Spinos, B.S., M.S.

Laboratory Supervisor

Bernard J. Lemire, B.S.

The Chemistry Curriculum has three aims: first, to provide the intellectual stimulation and discipline of studying a physical science within the context of the Liberal Arts; second, to prepare students for graduate study in chemistry; and third, to impart a grasp of certain basic principles and techniques important in a variety of careers related to chemistry.

Specimen Program in CHEMISTRY

FIRST YEAR

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
10.111	Calculus	3	3	10.112	Calculus	3	3	10.113	Calculus	3	3
12.131	Gen. Chem.	3(3)	4	12.132	Gen. Chem.	3(3)	4	12.133	Gen. Chem.	3(6)	5
18.111	Gen. Biol.	2(3)	3	18.112	Gen. Biol.	2(3)	3	18.113	Gen. Biol.	2(3)	3
30.101	English	3	3	30.102	English	3	3	30.103	English	3	3
	Mod. Lang. (Ger. or Russ.)	3	3		Mod. Lang. (Ger. or Russ.)	3	3		Mod. Lang. (Ger. or Russ.)	3	3

SECOND YEAR

QUARTER 4				QUARTER 5			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
10.144	Calculus	4	4	10.145	Calculus	4	4
11.120	Physics	4(4)	5	11.121	Physics	4(4)	5
12.153	Organic Chem.	3(3)	4	12.154	Organic Chem.	3(3)	4
	Mod. Lang. or Elective	4	4		Mod. Lang. or Elective	4	4

THIRD YEAR

QUARTER 6				QUARTER 7			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
12.155	Org. Chem.	3(6)	5	10.207	Diff. Equations	4	4
12.161	Phys. Chem.	4(3)	5	12.162	Phys. Chem.	4(3)	5
	Electives		8	12.176	Anal. Chem.	4	4
					Elective		8

FOURTH YEAR

QUARTER 8				QUARTER 9			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
12.163	Phys. Chem.	3(3)	4	12.178	Anal. Chem.	1(6)	3
12.177	Anal. Chem.	3(6)	5	12.182	Chem. Lit.	2	2
	Electives		8		Electives		8

FIFTH YEAR

QUARTER 10				QUARTER 11			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
12.211	Adv. Inorg. Chem.	2	2	12.212	Adv. Inorg. Chem.	2	2
12.253	Ident. Org. Com.	1(6)	3	12.284	Adv. Chem. Syn.	(9)	3
12.251	Adv. Org. Chem. or	4	4		or		
12.261	Adv. Phys. Chem.	4	4	12.286	Adv. Chem. Meas.	(9)	3
	Electives		8		Electives		8

Drama and Speech Department

Eugene J. Blackman, Professor and Chairman, B.S., M.A.

Assistant Professors

Lawrence J. Blumsack, B.S., M.S.

Mort S. Kaplan, B.A., M.A.

Michael L. Woodnick, B.S., M.S.

Jerrold Phillips, Ph.D.

Instructor

Carl W. Eastman, B.A., M.A.

Studying for the theatre can prepare a student for professional, educational and community theatre, (in lighting, designing, publicizing, criticizing, organizing the business forces, preparing budgets, estimating costs, creating and executing costumes, directing, acting, playwriting) and for many other theatre-allied professions — journalistic play reviewing, public relations and advertising, television and radio production and writing, interior decorating. The student of drama can cultivate an understanding and appreciation of one of society's main civilizing forces; develop his creative, emotional, and intellectual powers, his standard of taste and craftsmanship; and gain insight into human behavior and emotion.

Specimen Program in
DRAMA

FIRST YEAR

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
16.106	Earth Science	3	3	16.107	Earth Science	3	3	16.108	Earth Science	3	3
22.101	Intr. Pol. Sci. I	3	3	22.102	Intr. Pol. Sci. II	3	3	22.103	Intr. Pol. Sci. III	3	3
23.101	West. Civ.	3	3	23.102	West. Civ.	3	3	23.103	West. Civ.	3	3
30.101	English	3	3	30.102	English	3	3	30.103	English	3	3
	Mod. Lang.	3	3		Mod. Lang.	3	3		Mod. Lang.	3	3

SECOND YEAR

QUARTER 4				QUARTER 5			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
29.110	Voice and Artic.	4	4	29.150	Acting	4	4
29.200	Hist. of Theater	4	4	29.201	Hist. of Theater	4	4
19.107	Gen. Psych. I	3(2)	4	19.108	Gen. Psych. II	3(2)	4
	or				or		
20.100	Prin. Soc. Anthr.	4	4	21.100	Prin. Sociology	4	4
	Mod. Lang.	4	4		Mod. Lang.	4	4
	or				or		
	Elective	4	4		Elective	4	4

THIRD YEAR

QUARTER 6				QUARTER 7			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
29.170	Scenic Prod.	4	4		Drama Elective	4	4
	Electives		12		Electives		12

FOURTH YEAR

QUARTER 8				QUARTER 9			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
29.160	Concepts of Dir.	4	4		Drama Elective	4	4
	Drama Elective	4	4		Drama Elective	4	4
	Electives		8		Electives		8

FIFTH YEAR

QUARTER 10				QUARTER 11			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
	Drama Elective	4	4	29.280	Senior Project	4	4
	Drama Elective	4	4		Drama Elective	4	4
	Electives		8		Electives		8

Economics Department

Morris A. Horowitz, Professor and Chairman, B.A., Ph.D.

Professors

Irwin L. Herrnstadt, B.A., Ph.D.
 Wilfred S. Lake, A.B., M.A., Ph.D.
 G. Donald Shelby, B.A., Ph.D.

Associate Professors

Conrad P. Caligaris, B.B.A.,
 M.A., Ph.D.
 Ernest M. DeCicco, B.S., A.M.,
 Ph.D.
 Harold M. Goldstein, A.B., M.A.,
 Ph.D.
 Leon S. Graubard, A.B., M.A.
 Larry M. Hersh, A.B., M.A.
 Ivory L. Lyons, A.B., A.M., Ph.D.
 Gustav Schachter, B.S., M.B.A.,
 Ph.D.

Assistant Professors

James W. Meehan, Jr., B.A., Ph.D.
 Peter V. Mini, B.S., Ph.D.

Instructors

James W. Dean, B.Sc.
 James W. Doane, A.B.
 Harris E. Hordon, B.A., M.A.
 Richard K. Skillman, A.B., M.A.,
 M.A.L.D.

Lecturers

George Gostenhofer, B.S., M.A.
 Thurai S. Venkataswami, M.A.

Economists study the ways in which men make their living and the factors which determine their success or failure in satisfying their material needs.

Some economists are concerned with such problems as the control of inflation, the prevention of depression, and the development of farm, wage, tax, and tariff policies. Others develop comprehensive theories to explain the causes of unemployment and employment or the ways in which international trade influences world economic conditions. Still others are concerned with the collection and interpretation of data on a wide variety of economic problems.

Specimen Program in
ECONOMICS

FIRST YEAR

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
16.106	Earth Science	3	3	16.107	Earth Science	3	3	16.108	Earth Science	3	3
22.101	Intr. Pol. Sci. I	3	3	22.102	Intr. Pol. Sci. II	3	3	22.102	Intr. Pol. Sci. III	3	3
23.101	West. Civ.	3	3	23.102	West. Civ.	3	3	23.103	West. Civ.	3	3
30.101	English	3	3	30.102	English	3	3	30.103	English	3	3
	Mod. Lang.	3	3		Mod. Lang.	3	3		Mod. Lang.	3	3

SECOND YEAR

QUARTER 4				QUARTER 5			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
10.104	Fund. of Math.	4	4	10.105	Fund. of Math.	4	4
20.100	Prin. Soc.			21.100	Prin. Sociology	4	4
	Anthrop.	4	4	39.116	Prin. & Prob.		
39.115	Prin. & Probs.				Econ.	4	4
	Econ.	4	4		Mod. Lang.	4	4
	Mod. Lang.	4	4		or		
	or				Elective	4	4
	Elective	4	4				

THIRD YEAR

QUARTER 6				QUARTER 7			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
19.107	Gen. Psych. I	3(2)	4	19.108	Gen. Psych. II	3(2)	4
39.250	Statistics	4	4	39.251	Statistics	4	4
39.255	MicroEco. Th.	4	4	39.256	MacroEco. Th.	4	4
	Elective		4		Elective		4

FOURTH YEAR

QUARTER 8				QUARTER 9			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
	Econ. Elective	4	4		Econ. Elective	4	4
	Electives		12		Electives		12

FIFTH YEAR

QUARTER 10				QUARTER 11			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
	Econ. Elective	4	4		Econ. Elective	4	4
	Econ. Elective	4	4		Econ. Elective	4	4
	Electives		8		Electives		8

English Department

Paul C. Wermuth, Professor and Chairman, A.B., M.A., Ph.D.

Professors

James T. Barrs, A.B., A.M., Ph.D.
 Victor E. Howes, A.B., M.A., Ph.D.
 Samuel F. Morse, A.B., A.M., Ph.D.
 Franklin Norvish, S.B., M.A.

Associate Professors

Raymond E. Blois, B.S., M.A., Ph.D.
 George Khiralla, S.B., A.M.
 William H. Reynolds, B.S., M.A.
 Lloyd A. Skiffington, B.A., M.A.
 Reva Stump, Ph.D.

Assistant Professors

Samuel J. Bernstein, B.A., M.A.,
 Ph.D.
 Donald R. Berry, B.A., M.A.
 Gerald R. Griffin, B.A., M.A.
 John Kazanti, A.B., M.A., Ph.D.

Assistant Professors (continued)

John H. Martin, B.A., M.A., Ph.D.
 Alan R. Rosen, B.A., M.A.
 John F. Santas, B.A., M.A., Ph.D.
 Hassell B. Sledd, B.A., M.A., Ph.D.
 Harvey Vetstein, B.A., M.A.
 Gerald M. Weisenberg, A.B., M.A.

Instructors

Leonard G. Abram, B.S., M.A.
 Robert M. Arlett, B.A., M.A.
 Frederick Calatrello, A.B., M.A.
 Joseph B. DeRoche, B.A., M.F.A.
 Richard Elia, A.B., M.A.
 Judith R. Goodman, B.A., M.A.
 James E. Hanley, B.S., M.A.
 Theodore J. Love, A.B., M.A.
 Dennis B. McCormick, B.A., M.A.
 Robert L. Trew, B.A., M.A.
 Mary B. Wilk, B.S., M.A.

The English curriculum is aimed at providing a broad, general background in literature to its students as well as train all students in the use of communication skills.

Journalism Department

Associate Professor

George A. Speers, Chairman,
 A.B., M.S., M.Ed.

Instructors

Allen F. Azer, B.A., M.S.
 Edward F. Quarrington, A.B.

A total of eight courses is currently offered in the Department of Journalism. They were selected primarily to meet two objectives. First, they were chosen to meet the requirements of the journalism graduate schools throughout the country. Secondly, the course selections were made to provide a broad understanding of the principles and practices of journalism yet provide applicability to various other disciplines. The currently accepted philosophy in journalism education of a ratio of 80% liberal arts courses to 20% undergraduate specialized courses serves as a basic guideline in the structuring of the journalism academic programs.

Specimen Program in ENGLISH AND ENGLISH-JOURNALISM

FIRST YEAR

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
16.106	Earth Science	3	3	16.107	Earth Science	3	3	16.108	Earth Science	3	3
22.101	Intr. Pol. Sci. I	3	3	22.102	Intr. Pol. Sci. II	3	3	22.103	Intr. Pol. Sci. III	3	3
23.101	West. Civ.	3	3	23.102	West. Civ.	3	3	23.103	West. Civ.	3	3
30.101	English	3	3	30.102	English	3	3	30.103	English	3	3
	Mod. Lang.	3	3		Mod. Lang.	3	3		Mod. Lang.	3	3

SECOND YEAR

QUARTER 4				QUARTER 5			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
23.130	Eng. to 1688	4	4	23.131	Eng. since 1688	4	4
30.110	Lit. Analysis	4	4	30.111	Lit. Anal. Novel	4	4
26.101	Intr. to Phil. I	4	4		or		
20.100	Prin. of Soc.			30.112	Lit. Anal. Drama	4	4
	Anthr.	4	4	26.102	Intr. to Phil. II	4	4
	Mod. Lang.	4	4		or		
	or			20.103	Elem. of Cult.		
	Elective	4	4		Anthr.	4	4
					Mod. Lang.	4	4
					or		
					Elective	4	4

THIRD YEAR

QUARTER 6				QUARTER 7			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
30.174	Eng. Lit. I	4	4	30.175	Eng. Lit. II	4	4
38.103	News Writing	4	4	38.104	News Writing	4	4
	or				Eng. Elect.	4	4
	Eng. Elect.	4	4		Electives		
	Electives		4				

FOURTH YEAR

QUARTER 8				QUARTER 9			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
30.176	Eng. Lit. III	4	4	30.177	Eng. Lit. IV	4	4
	Eng. Elec.	4	4		Eng. Elec.	4	4
	or				or		
38.105	Tech. Journ.	4	4	38.106	Tech. Journ.	4	4
	Electives		4		Electives		4

FIFTH YEAR

QUARTER 10				QUARTER 11			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
	Eng. Elec.	4	4		Eng. Elec.	4	4
	Eng. Elec.	4	4		Electives		12
	Electives		8				

History Department

Raymond H. Robinson, Professor and Chairman, Ph.D.

Professor

Wallace P. Bishop, Ph.D.

Associate Professors

Philip N. Backstrom, Jr., Ph.D.

Robert A. Feer, Ph.D.

Martha E. Francois, Ph.D.

Norbert L. Fullington, Ph.D.

Norman Rosenblatt, Ph.D.

Stanley R. Stembridge, Ph.D.

Assistant Professors

Ruth T. Anderson, Ph.D.

Amelia E. Cutts, M.A.

May Sobel, Ph.D.

Instructors

Suzanne Hamner, M.A.

Gerald H. Herman, M.A.

Lecturers

Helen S. Frothingham, M.A.

Walter Jones, M.A.L.D.

The Department of History requires all majors to take the Freshman survey of Western Civilization, the Sophomore survey of American History, and the Middler course, The Historian's Craft. The remaining 40 credits of history are to be divided among the following groups: 8 credits in Group A — Ancient, Medieval, and Early Modern Europe; 8 credits in Group B — Modern Europe; 8 credits in Group C — British North American Colonies and the United States; 8 credits in Group D — Other Areas or Regions; and 8 credits in any of the four groups. By encouraging courses in various times and places, the Department hopes to minimize overspecialization at the undergraduate level. For the same reason the Department urges students to use their electives for courses outside the discipline of history.

Specimen Program in
HISTORY

FIRST YEAR

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
16.106	Earth Science	3	3	16.107	Earth Science	3	3	16.108	Earth Science	3	3
22.101	Intr. Pol. Sci. I	3	3	22.102	Intr. Pol. Sci. II	3	3	22.103	Intr. Pol. Sci. III	3	3
23.101	West. Civ.	3	3	23.102	West. Civ.	3	3	23.103	West. Civ.	3	3
30.101	English	3	3	30.102	English	3	3	30.103	English	3	3
	Mod. Lang.	3	3		Mod. Lang.	3	3		Mod. Lang.	3	3

SECOND YEAR

QUARTER 4				QUARTER 5			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
23.210	U.S. to 1865	4	4	21.100	Prin. Sociol.	4	4
26.101	Intr. Phil. I	4	4	23.211	U.S. since 1865	4	4
39.115	Prin. & Prob.			39.116	Prin. & Prob.		
	Econ.	4	4		Econ	4	4
	Mod. Lang.	4	4		Mod. Lang.		
	or				or		
	Elective	4	4		Elective	4	4

THIRD YEAR

QUARTER 6				QUARTER 7			
No.	Course	Cl.	Q.H.*	No.	Course	Cl.	Q.H.
23.199	Hist's Craft	4	4		History Elec.	4	4*
	History Elec.	4	4*		History Elec.	4	4*
	Electives		8		Electives		8

FOURTH YEAR

QUARTER 8				QUARTER 9			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
	History Elec.	4	4*		History Elec.	4	4*
	History Elec	4	4*		History Elec.	4	4*
	Electives		8		Electives		8

FIFTH YEAR

QUARTER 10				QUARTER 11			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
	History Elec.	4	4*		History Elec.	4	4*
	History Elec.	4	4*		Electives		12
	Electives		8				

*For information about distribution of History Electives, see Department of History.

Mathematics Department

Harold L. Stubbs, Professor and Chairman, A.B., M.A., Ph.D.

Professors

Edward M. Cook, A.B., M.A.
 Daniel Gorenstein, A.B., M.A., Ph.D.
 Arshag B. Hajian, M.S., Ph.D.
 Valentin R. Poenaru, Dipl.M., D.Sc.
 Flavio B. Reis, B.S., M.S., Ph.D.
 Giuliano Sorani, Laurea in
 Mathematics
 Jack Warga, B.A., Ph.D.

Visiting Professor

Barry C. Mazur, Ph.D.

Associate Professors (continued)

Alberto P. Galmarino, A.B., Ph.D.
 Samuel M. Givens, A.B., M.A.
 Robert D. Klein, B.S., M.S.
 Norman S. McCallister, A.B., Ed.M.
 Francis B. Shepardson, B.A., M.Ed.
 Victor R. Staknis, B.S., A.M., Ph.D.

Visiting Associate Professor

Jonathan L. Alperin, A.B., A.M., Ph.D.

Associate Professors

Roger M. Antoine, B.S., M.A.
 Shirley A. Blackett, A.B., M.Ed.
 Robert A. Bonic, M.S., Ph.D.
 Edward J. Booth, A.B., Ed.M.
 Bruce B. Clafflin, A.B., M.S.
 Warren C. Dean, A.B., M.A.
 Horace L. de Rivera, B.S., M.A.
 Ellen H. Dunlap, B.A.
 David I. Epstein, A.B., M.S., Ph.D.
 Holland C. Filgo, Jr., B.S., M.A.,
 Ph.D.

Assistant Professors

Arienne S. Balser, B.A.
 Jacob Barshay, A.B., M.A., Ph.D.
 John Frampton, B.S., M.S., Ph.D.
 Maurice E. Gilmore, A.B., M.S., Ph.D.

Instructors

Samuel J. Blank, B.A., Ph.D.
 Mark Bridger, B.A., M.A.
 Tamar Burak, M.S.
 Betty Yuen-Tching Lou, B.A., M.A.
 Richard A. Rasala, A.B., A.M.

The mathematics curriculum has a two-fold objective: to prepare its students for careers in applied mathematics or in pure mathematics. The Department has organized its program so that all of its applied mathematics students must choose certain electives in the College of Engineering while its pure mathematics students emphasize the theoretical aspects of mathematics.

Specimen Program in MATHEMATICS

FIRST YEAR

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
10.201	Calculus	5 5	10.203	Algebra	5 5	10.202	Calculus	5 5
11.151	Physics	3 3	11.152	Physics	3 3	11.153	Physics	3 3
30.101	English	3 3	30.102	English	3 3	30.103	English	3 3
	Mod. Lang.	3 3		Mod. Lang.	3 3		Mod. Lang.	3 3

SECOND YEAR

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
10.204	Calculus	4 4	10.205	Calculus	4 4
10.206	Algebra	4 4	10.208	Probability	4 4
11.104	Physics	3 3		or	
	and		10.207	Differ. Equat.	4 4
11.110	Physics Lab	(3) 1	11.105	Physics	3 3
	or			and	
12.135	Gen. Chem.	3(3) 4	11.111	Physics Lab	(3) 1
	Mod. Lang.	4 4		or	
	or		12.136	Gen. Chem.	4 4
	Elective	4 4		Mod. Lang.	4 4
				or	
				Elective	4 4

THIRD YEAR

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
10.251	Analysis	4 4	10.252	Analysis	4 4
10.220	Math. Stat.	4 4	10.207	Differ. Equat.	4 4
	or			or	
	Elective	4 4		Elective	4 4
	Electives	8		Electives	8

FOURTH YEAR

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
10.221	Applied Anal.	4 4	10.222	Applied Anal.	4 4
	or			or	
10.254	Algebra	4 4	10.255	Algebra	4 4
	Electives	12		Electives	12

FIFTH YEAR

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
10.223	Num. Anal.	4 4	10.224	Num. Anal.	4 4
	or			or	
10.253	Analysis	4 4		Math. Elec.	4 4
	Electives	12		Electives	12

Where a choice of mathematics courses is shown, the first course listed must be selected by students choosing the applied mathematics option. In Quarters 8, 9, and 10, the second course listed must be taken by students selecting the pure mathematics option. For information describing these options, consult the department.

Modern Languages Department

Louis Cooperstein, Professor and Chairman, B.A., M.A.

Professor

Antonio L. Mezzacappa, B.A.,
M.A., Ph.D.

Associate Professors

Israel Aluf, B.A., M.A., Ph.D.
Benedetto Fabrizi, B.S., M.A.,
D.M.L.
Samuel Jaramillo, Ph.D.
Philip H. Stephen, B.A., M.A.,
Ph.D.
Edward B. Williams, B.A., M.A.,
Ph.D.

Assistant Professors

Nazzareno F. Cedrone, A.B., A.M.,
Ph.D.
John Spiegel, B.A., M.A.

Instructors

Barbara Barrus, B.A., M.A.
Elizabeth Boehme, B.A., M.A.
Anthony Ford, B.A., M.A.
Joyce Gaydosh, B.A., M.A.
Raquel M. Halty, B.A., M.A.
Robert B. Modee, B.A., M.A.
Berta Riesco, Ed.D.
Harry C. Snyder, Jr., B.A., M.A.

The Department of Modern Languages offers a program leading to a degree in Modern Languages. Students are offered a choice of French, German, Russian, or Spanish. One of these languages will be designated as the major language, with a second as the minor language. In each of the four, the courses offered range from the very basic elementary course to the advanced literature courses for majors. Thus, a student may continue with a language already studied, or he may begin an entirely new language.

In order to major, a student would normally be required to take a minimum of 32 quarter credits in the major language, and 8 quarter credits in the minor. In each case, these credits must be earned in courses **beyond** the intermediate level. (Students whose program permits would be encouraged to study a third language as well.)

Specimen Program in
MODERN LANGUAGES

FIRST YEAR

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
16.106	Earth Science	3	3	16.107	Earth Science	3	3	16.108	Earth Science	3	3
22.101	Intr. Pol. Sci. I	3	3	22.102	Intr. Pol. Sci. II	3	3	22.103	Intr. Pol. Sci. III	3	3
23.101	West. Civ.	3	3	23.102	West. Civ.	3	3	23.103	West. Civ.	3	3
30.101	English	3	3	30.102	English	3	3	30.103	English	3	3
	Mod. Lang.	3	3		Mod. Lang.	3	3		Mod. Lang.	3	3

SECOND YEAR

QUARTER 4				QUARTER 5			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
23.210	U.S. to 1865	4	4	23.211	U.S. since 1865	4	4
30.170	Surv. Eng. Lit.	4	4	30.171	Surv. Eng. Lit.	4	4
39.115	Prin. & Prob.			39.116	Prin. & Prob.		
	Econ.	4	4		Econ.	4	4
	Mod. Lang.	4	4		Mod. Lang.	4	4
	or				or		
	Elective	4	4		Elective	4	4

THIRD YEAR

QUARTER 6				QUARTER 7			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
	Adv. Lang. Elec.	4	4		Adv. Lang. Elec.	4	4
	Electives		12		Electives		12

FOURTH YEAR

QUARTER 8				QUARTER 9			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
	Adv. Lang. Elec.	4	4		Adv. Lang. Elec.	4	4
	Adv. Lang. Elec.	4	4		Adv. Lang. Elec.	4	4
	Electives		8		Electives		8

FIFTH YEAR

QUARTER 10				QUARTER 11			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
	Adv. Lang. Elec.	4	4		Adv. Lang. Elec.	4	4
	Adv. Lang. Elec.	4	4		Adv. Lang. Elec.	4	4
	Electives		8		Electives		8

Philosophy and Religion Department

Walter L. Fogg, Associate Professor and Chairman, B.A., M.A., Ph.D.

Professor

Charles W. Havice, A.B., M.A.,
S.T.B., Ph.D., D.D.

Instructors

Ellen Gordon, B.A., M.A.
Michael Marlies, B.A.
Herbert S. Patchell, B.A., M.A.

Associate Professor

Edward A. Hacker, B.A., M.A., Ph.D.

Lecturers

Spencer Lavan, B.A., M.A.
Judith Lynsford, B.A., M.A.
Kenneth Lucey, B.A., M.A.

Assistant Professors

Sally J. Michael, A.B., M.A., Ph.D.
Joseph H. Wellbank, A.B., A.M., Ph.D.

The philosophy programs are designed to (1) offer a sufficient number and variety of courses to provide a balanced curriculum for philosophy majors in the department; (2) offer to the other areas of concentration philosophy and religion courses that will strengthen their curricula; and (3) provide all students with a knowledge of the methods and traditions of philosophy.

Specimen Program in PHILOSOPHY

FIRST YEAR

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
16.106	Earth Science	3	3	16.107	Earth Science	3	3	16.108	Earth Science	3	3
22.101	Intr. Pol. Sci. I	3	3	22.102	Intr. Pol. Sci. II	3	3	22.103	Intr. Pol. Sci. III	3	3
23.101	West. Civ.	3	3	23.102	West. Civ.	3	3	23.103	West. Civ.	3	3
30.101	English	3	3	30.102	English	3	3	30.103	English	3	3
	Mod. Lang.	3	3		Mod. Lang.	3	3		Mod. Lang.	3	3

SECOND YEAR

QUARTER 4				QUARTER 5			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
19.107	Gen. Psych. I	3(2)	4	19.108	Gen. Psych. II	3(2)	4
20.100	Prin. Soc.			21.100	Prin. Soc.	4	4
	Anthro.	4	4	26.102	Intr. Phil. II	4	4
26.101	Intr. Phil. I	4	4		Mod. Lang.	4	4
	Mod. Lang.	4	4		or		
	Elective	4	4		Elective	4	4

THIRD YEAR

QUARTER 6				QUARTER 7			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
26.150	Intr. Logic	4	4	26.155	Ethics	4	4
	Electives		12		Electives		12

FOURTH YEAR

QUARTER 8				QUARTER 9			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
26.110	Hist. Anc. Phil.	4	4	26.111	Hist. Mod. Phil.	4	4
	Philosophy Elec.	4	4		Philosophy Elec.	4	4
	Electives		8		Electives		8

FIFTH YEAR

QUARTER 10				QUARTER 11			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
26.118	20th Cent. Phil.	4	4		Philosophy Elec.	4	4
	Philosophy Elec.	4	4		Philosophy Elec.	4	4
	Electives		8		Electives		8

Physics Department

Reginald G. Lacount, Professor and Chairman, S.B., M.A., Ph.D.

Professors

Richard L. Arnowitt, B.S., M.S.,
Ph.D.
Marvin H. Friedman, B.S., Ph.D.
Walter Hauser, B.S., Ph.D.
Giovanni Lanza, Ph.D.
Elliot H. Lieb, B.S., Ph.D.
Bertram J. Malenka, A.B., A.M.,
Ph.D.
Carl A. Shiffman, B.S., Ph.D.
Thomas H. Wallace, B.S., M.A.,
Ph.D.
Roy Weinstein, S.B., Ph.D.

Visiting Professor

Petros N. Argyres, A.B., M.A., Ph.D.

Associate Professors

Ronald Aaron, A.B., Ph.D.
Jonas Alster, Ph.D.
Alan H. Cromer, B.S., Ph.D.
Marvin W. Gettner, B.S., Ph.D.
Michael G. Glaubman, M.S., Ph.D.
Bernard Gottschalk, B.S., Ph.D.

Associate Professors (continued)

Richard E. Grojean, B.S., M.S.
Eugene J. Saletan, B.A., M.A., Ph.D.
Yogi N. Srivastava, B.S., M.S.,
Ph.D.
Michael T. Vaughn, A.B., Ph.D.

Assistant Professors

Hans Von Briesen, B.S., Ph.D.
Hyman Goldberg, B.S., Ph.D.
Pram Nath, B.Sc., M.S., Ph.D.
James E. Neighbor, B.S., S.M., Ph.D.
Morton S. Weiss, B.S., Ph.D.
Yitzhak Y. Sharon, A.B., Ph.D.
Allan Widom, B.S.
Fa Yueh Wu, B.S., M.S., Ph.D.

Visiting Assistant Professors

Donald H. Kobe, B.S., M.S., Ph.D.
Gerhard Lutz, B.S., M.S., Ph.D.

Instructor

Lloyd C. Kannenberg, S.B., M.S.,
Ph.D.

Physics majors may follow either a regular four year course of study or the five year cooperative course of study. Transfers between the four year and the five year programs should go smoothly, and registration in either is not an irrevocable decision on the part of the student.

In either case, the available undergraduate physics program is the same and is intended to provide a thorough introduction to classical and modern physics in order to prepare the student for graduate work in physics or engineering, or for entry into industry.

Considerable flexibility is allowed for electives. These enable those students preparing for graduate school in physics to study the subject in depth while others may elect to devote some of their course work to other sciences, to engineering or to non-sciences. The range of courses covered is typical of what will be found in excellent physics curricula throughout the United States. In addition, advanced study and research is available to some undergraduates because of the presence of our graduate programs.

The minimum requirements in Physics for the B.A. degree are as follows: —
above the sophomore year

Physics	3 courses	12 quarter hours
	3 laboratory courses	6 quarter hours
Mathematics	1 course	4 quarter hours

Specimen Program in PHYSICS

FIRST YEAR

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
10.201	Calculus	5	5	10.202	Calculus	5	5	10.203	Algebra	5	5
11.151	Physics	3	3	11.152	Physics	3	3	11.153	Physics	3	3
11.161	Physics Lab.	(3)	1	11.162	Physics Lab.	(3)	1	11.163	Physics Lab.	(3)	1
30.101	English	3	3	30.102	English	3	3	30.103	English	3	3
	Mod. Lang.	3	3		Mod. Lang.	3	3		Mod. Lang.	3	3

SECOND YEAR

QUARTER 4				QUARTER 5			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
10.204	Calculus	4	4	10.205	Calculus	4	4
11.154	Physics	4	4	11.155	Physics	4	4
11.164	Physics Lab.	(3)	1	11.165	Physics Lab.	(3)	1
11.170	Surv. Cont.			26.150	Intro. Logic	4	4
	Physics	3	3		or		
	Mod. Lang.	4	4	26.153	Phil. of Sci.	4	4
	or				Mod. Lang.	4	4
	Elective	4	4		or		
					Elective	4	4

THIRD YEAR

QUARTER 6				QUARTER 7			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
10.251	Analysis	4	4	10.252	Analysis	4	4
11.200	Mech. I	4	4	11.201	Mech. II	4	4
11.260	Wave Lab.	2(3)	4	11.220	Therm. & Kin.		
	Sci. Elective	4	4		Theo.	4	4
				11.261	Exp. Lab.	1(4)	3
					Sci. Elec.	4	4

FOURTH YEAR

QUARTER 8				QUARTER 9			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
11.210	Elec. & Mag. I	3	3	10.207	Diff. Equations	4	4
11.230	Mod. Phys. Lab	4	4		Electives		12
11.262	Elect. Lab.	1(4)	3				
	Electives		4				

FIFTH YEAR

QUARTER 10				QUARTER 11			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
11.211	Elec. & Mag. II	4	4	11.212	Elec. & Mag. III	4	4
11.263	Mod. Phys. Lab	1(4)	3	11.241	Quantum II	4	4
11.240	Quantum I	4	4		or		
	or				Elective	4	4
	Elective	4	4		Electives		4
	Electives		4				

Consult the department about variations in the program.

Political Science Department

R. Gregg Wilfong, Professor and Chairman, A.B., M.A., Ph.D.

Professor

David W. Barkley, A.B., M.A.,
Ph.D., M.P.A.

Assistant Professors

Robert L. Cord, B.B.A., M.A., D.S.S.
Minton F. Goldman, B.A., M.A.,
M.A.L.D., Ph.D.

Associate Professors

L. Gerald Bursey, B.A., A.M., Ph.D.
Steve Worth, B.S., Ph.D.

Duane L. Grimes, A.B., M.A.
Edwin D. Palmer, A.B., M.P.A.

The undergraduate political science curriculum is designed to prepare a student for graduate study in political science or the law or for a public service career. It is also a very appropriate major for the student interested in a broad liberal arts education. To accomplish these goals the political science major is required to take the following core course in the major sub-fields of political science: comparative government, American government, international relations, public administration and political theory. To complement these, electives may be chosen from a variety of courses based on one's own special field of interest.

Specimen Program in
POLITICAL SCIENCE

FIRST YEAR

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
16.106	Earth Science	3	3	16.107	Earth Science	3	3	16.108	Earth Science	3	3
22.101	Intr. Pol. Sci. I	3	3	22.102	Intr. Pol. Sci. II	3	3	22.103	Intr. Pol. Sci. III	3	3
23.101	West. Civ.	3	3	23.102	West. Civ.	3	3	23.103	West. Civ.	3	3
30.101	English	3	3	30.102	English	3	3	30.103	English	3	3
	Mod. Lang.	3	3		Mod. Lang.	3	3		Mod. Lang.	3	3

SECOND YEAR

QUARTER 4				QUARTER 5			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
22.151	Comp. Govt.	4	4	22.131	Amer. Nat. Govt.	4	4
23.210	U.S. to 1865	4	4	23.211	U.S. since 1865	4	4
39.115	Prin. & Prob.			39.116	Prin. & Prob.		
	Econ.	4	4		Econ.	4	4
	Mod. Lang.	4	4		Mod. Lang.	4	4
	or				or		
	Elective	4	4		Elective	4	4

THIRD YEAR

QUARTER 6				QUARTER 7			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
20.100	Prin. Soc.			21.100	Prin. Soc.	4	4
	Anthr.	4	4		Pol. Sci. Elec.	4	4
22.221	Intern. Relations	4	4		Electives		8
	Electives		8				

FOURTH YEAR

QUARTER 8				QUARTER 9			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
22.261	Public Admin.	4	4		Pol. Sci. Elec.	4	4
	Pol. Sci. Elec.	4	4		Pol. Sci. Elec.	4	4
	Electives		8		Electives		8

FIFTH YEAR

QUARTER 10				QUARTER 11			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
22.271	Pol. Theory	4	4		Pol. Sci. Elec.	4	4
	Pol. Sci. Elec.	4	4		Pol. Sci. Elec.	4	4
	Electives		8		Electives		8

Psychology Department

A. Bertram Warren, Professor and Chairman, A.B., M.A., Ph.D.

Professors

John C. Armington, B.S., M.S.,
Ph.D.
Warren H. Teichner, B.A., M.S.,
Ph.D.
Harold S. Zamansky, B.S., Ph.D.

Assistant Professors

Edward A. Arees, B.B.A., M.S., Ph.D.
Richard H. Lent, A.B., M.A., Ph.D.
Ina Samuels, Ph.B., B.A., M.A., Ph.D.
Dale R. Schissler, B.S., Ph.D.

Associate Professors

Roger F. Brightbill, A.B., Ph.D.
Charles Karis, A.B., A.M., Ph.D.
Helen B. Mahut, B.A., M.A., Ph.D.
Bertram Scharf, B.A., Ph.D.

Psychologists study the way people (and, sometimes, animals) behave and the reasons for their behavior. They study the behavior in the lab under controlled conditions and also in clinical and in natural settings. However, most psychologists either deal with the emotional problems of people in real life or are involved in the programs to evaluate aptitude and skills. They develop tests which evaluate aptitudes and skills and use test results as well as other techniques to assist them in understanding people.

Specimen Program in
PSYCHOLOGY

FIRST YEAR

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
16.106	Earth Science	3 3	16.107	Earth Science	3 3	16.108	Earth Science	3 3
22.101	Intr. Pol. Sci. I	3 3	22.102	Intr. Pol. Sci. II	3 3	22.103	Intr. Pol. Sci. III	3 3
23.101	West. Civ.	3 3	23.102	West. Civ.	3 3	23.103	West. Civ.	3 3
30.101	English	3 3	30.102	English	3 3	30.103	English	3 3
	Mod. Lang.	3 3		Mod. Lang.	3 3		Mod. Lang.	3 3

SECOND YEAR

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
10.104	Math.	4 4	10.105	Math.	4 4
19.107	Gen. Psych.	4 4	19.108	Gen. Psych.	4 4
20.100	Anthropology	4 4	21.100	Sociology	4 4
	Language	4 4		Language	4 4
	or			or	
	Elective	4 4		Elective	4 4

THIRD YEAR

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
19.120	Stat. in Psych.	4 4	19.121	Stat. in Psych.	4 4
	Biology	4 4		Biology	4 4
	Psych. Elect.	4 4		Psych. Elect.	4 4
	Elective	4 4		Elective	4 4

FOURTH YEAR

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
19.160	Exp. Psych. I	3(3) 4	19.161	Exp. Psych. II	3(3) 4
	Psych. Elect.	4 4		Psych. Elect.	4 4
	Electives	8		Electives	8

FIFTH YEAR

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
19.162	Exp. Psych. III	3(3) 4	19.211	Systems of Psych.	4 4
19.210	Hist. of Psych.	4 4		Psych. Elect.	4 4
	Electives	8		Electives	8

Sociology and Anthropology Department

Frank F. Lee, Professor and Chairman, B.A., M.A., Ph.D.

Professor

Stephen Schafer, D.Jur., Prof.
Agregé

Assistant Professors

William J. Bowers, A.B., Ph.D.
Masri Singarimbun, B.A., Ph.D.
Robert S. Weppner, B.S., M.S.

Associate Professors

Theodore N. Ferdinand,
B.S., M.S., Ph.D.
Morris Freilich, B.A., Ph.D.
Morton Rubin, B.A., M.A., Ph.D.

Instructors

Sarah W. Lockeretz, B.A.
Nathaniel Raymond, B.A., M.A.

The undergraduate majors in the Department of Sociology and Anthropology offer a broad spectrum of courses designed to prepare the student for graduate work, and also to provide a general cultural major with opportunity for electives for those who do not desire advanced degrees. The objectives of this program are to discover the basic structure of human society, to identify the main forces that hold groups together or weaken them, and to learn the conditions that transform social life.

The student may elect to concentrate his studies in one of three areas: sociology, anthropology, or sociology/social welfare, depending upon his goals. Each of these alternatives provides the student with a thorough background in the parent fields together with an intensive preparation in the more specific area of his choice.

Cooperative work assignments vary from placement in mental hospitals and social agencies to placement in university, government, and other research laboratories. A full-time program of study is also available for those students who desire it.

Specimen Program in SOCIOLOGY AND ANTHROPOLOGY

(with a concentration in Sociology†)

FIRST YEAR

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
16.106	Earth Science	3	3	16.107	Earth Science	3	3	16.108	Earth Science	3	3
22.101	Intr. Pol. Sci. I	3	3	22.102	Intr. Pol. Sci. II	3	3	22.103	Intr. Pol. Sci. III	3	3
23.101	West. Civ.	3	3	23.102	West. Civ.	3	3	23.103	West. Civ.	3	3
30.101	English	3	3	30.102	English	3	3	30.103	English	3	3
	Mod. Lang.	3	3		Mod. Lang.	3	3		Mod. Lang.	3	3

SECOND YEAR

QUARTER 4				QUARTER 5			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
19.107	Gen. Psych. I	4	4	19.108	Gen. Psych. II	4	4
20.100	Prin. Soc. Ant.	4	4	21.100	Prin. Soc.	4	4
39.115	Prin. & Prob.			39.116	Prin. & Prob.		
	Econ.	4	4		Econ.	4	4
	Mod. Lang.	4	4		Mod. Lang.	4	4
	or				or		
	Elective	4	4		Elective	4	4

THIRD YEAR

QUARTER 6				QUARTER 7			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
21.111	Amer. Society	4	4	21.241	Soc. Res. II	3(2)	4
21.239	Stat. Anal.	2(2)	4		Electives	4	4
21.240	Soc. Res. Meth.	3(2)	4		Anthr. Elective	4	4
	Elective	4	4		Electives		4

FOURTH YEAR

QUARTER 8				QUARTER 9			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
21.280	Soc. Theory	4	4	21.281	Soc. Theory II	4	4
	Sociology Elec.	4	4		Anthr. Elective	4	4
	Electives		8		Electives	8	8

FIFTH YEAR

QUARTER 10				QUARTER 11			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
	Sociology Elec.	4	4		Sociology Elec.	4	4
	Electives		12		Electives		12

†Students desiring more concentration in either Anthropology or Social Welfare should contact the Department Chairman for a list of these courses.

FORSYTH DENTAL PROGRAM**FIRST YEAR**

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
12.101	Chemistry	2(3)	3	12.102	Chemistry	2(3)	3	18.110	Microbiology	2(3)	3
18.101	Biology	2(3)	3	18.102	Biology	2(3)	3	30.103	English	3	3
30.101	English	3	3	30.102	English	3	3	DH-05	Histology	3	3
DH-01	Dental Anatomy	2	2	DH-02	Dental Anatomy	2	2	DH-13	Clin. Dent. Hyg.	(6)	2
DH-11	Clin. Dent. Hyg.	2(3)	3	DH-12	Clin. Dent. Hyg.	2(3)	3	DH-20	Radiology	2	2
				DH-40	Nutrition	2	2	DH-28	Dental Materials	2(1)	2
								DH-60	Public Health	2	2

SECOND YEAR

QUARTER 4				QUARTER 5				QUARTER 6			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
18.148	Anatomy	3(3)	4	18.103	Physiology	3(3)	4	19.102	Psychology	4	4
DH-07	Pathology	2	2	DH-15	Clin. Dent. Hyg.	*15	3	21.102	Prin. Soc.		
DH-14	Clin. Dent. Hyg.	*15	3	DH-23	Dental				Relations	4	4
DH-22	Dental				Specialties	2	2	DH-03	Dental Anatomy	2	2
	Specialties	2	2	DH-30	Pharmacology	2	2	DH-16	Clin. Dent. Hyg.	*15	3
DH-61	Pub. Health	2	2	DH-70	Speech	2	2	DH-24	Dental		
	Physical Ed.	**			Physical Education	**			Specialties	2	2
								DH-50	Office Procedures	2	2
									Physical Education	**	

DH Courses give by the Forsyth Dental School.

() Lab Hours

* Clinic Hours

** Physical Education is an elective.

Art Department

Robert L. Wells, Associate Professor and Chairman, B.S., M.A.

Associate Professors

Ronald C. Davis, A.B., M.Ed.
Wheaton A. Holden, A.B., M.A.

Instructors

Samuel S. Bishop, B.A., M.A., M.F.A.
Peter Serenji, A.B., M.A., Ph.D.

Assistant Professors

Michael S. Dvorchak, A.B., M.A.
Leonard M. Havens, B.S., M.Ed.

The Art Department offers courses covering the history of Art. The evolution of architecture, sculpture, painting, graphic arts, minor arts, photography and film art is studied with emphasis on styles, techniques and cultural implications. Applied art courses are offered for creative expression in various art forms. The objective is to give the student a working knowledge of the structure of art.

Earth Sciences Department

J. Rosson Overcash, Associate Professor and Chairman, B.A., A.M.T.

Associate Professor

David L. Wilmarth, B.S., Ed.M.

Instructors

Cleveland O. Clarke, B.S., M.Ed.
William T. Harty, B.S., M.Ed.
Charles E. McClennen, B.A., M.A.T.
Lillian Morgenstern, A.B., A.M.
Joseph F. Walsh, B.S., M.Ed.

Assistant Professors

Bernard L. Gordon, B.S., M.S.
A. William Kochanczyk, B.S., M.Ed.
Richard D. Ruggles, A.B., A.M.

The department currently offers a broad spectrum of courses primarily for two groups of students: 1. Liberal Arts upperclass students desiring an elective in the area; 2. Education students majoring in the teaching of earth sciences.

Music Department

Roland Nadeau, Associate Professor and Chairman, B.M., M.M.

Associate Professor

Leo Snyder, B.M., M.M.

Part Time Instructor

Raymond Smith, B.M., M.M.

Assistant Professors

Joan C. Bicknell, B.S., M.A., Ph.D.
William A. Tesson, B.M., M.M.

Lecturer

Herbert Silverman, M.M., M.Ed.,
Ed.D.

The Music Department provides students an opportunity to gain an initial experience in music or to add to previous experience. To this end the department offers a varied program made up of:

1. **Synoptic courses** for students who might take only a single course.
2. **Course sequences** for students who wish to study some particular aspect of music in depth.

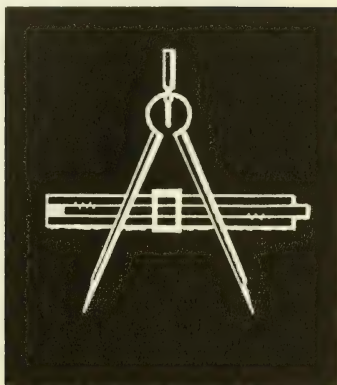


College of Engineering

Melvin Mark, Dean

Donald H. MacKenzie, Associate Dean

Otis F. Cushman, Assistant Dean



Aims

The College of Engineering offers five-year cooperative programs in civil, mechanical, electrical, chemical, industrial and biomedical engineering leading to the degree of Bachelor of Science with specification according to the engineering department in which the student qualifies. The curricula of the several departments effectively prepares students to seek employment in industry or to continue their education in graduate schools. The College is operated on the Cooperative Plan.

Day graduate programs are available in the Department of Chemical Civil, Mechanical, Industrial, and Electrical Engineering, and of Mathematics, and Physics, leading to the master's degree. The former are cooperative programs in engineering similar to the undergraduate cooperative programs. In Physics, conventional two-year, half-time fellowships are available.

Doctoral programs are available in Electrical, Chemical, and Mechanical Engineering.

Methods

The academic program begins with three quarters of full-time study. The freshman year concentrates on strengthening the student's general background in physical science and mathematics. Cooperative work begins with the sophomore year and continues throughout the upperclass years. Since the work assignments are in the same general field of engineering for which the student is preparing, he has an opportunity to gain insight into problems of actual engineering practice.

Emphasis throughout all Curricula is laid upon fundamental concepts and skills so that the student may develop an adequate foundation upon which to base his professional development. Instruction both in the classroom and in the laboratory is designed to place maximum emphasis upon individual initiative and responsibility and to develop the students powers of analysis.

Recognizing that graduates must be able to take their places in society as well as prepare for professional careers, a substantial part of all curricula is devoted to course work in the College of Liberal Arts. Students may elect programs from a wide variety regularly offered by the College.

Part-Time Program Offered During Evening Hours

The College of Engineering also offers eight-year curricula leading to the degree of Bachelor of Science in Electrical or Civil Engineering. Classes are held in the evening and Saturday mornings. Admission and course requirements are the same as for the degree under the Cooperative Plan. For further information consult the evening bulletin of the College of Engineering.

Power Systems Engineering

In order to meet the needs of the rapidly expanding electric-power industry, Northeastern has initiated a special program in power systems engineering. This program is an accelerated cooperative program which results in a master's degree in six years. The subject matter is basically that of electrical engineering augmented by additional work in power systems, economics, computer control, atomic energy, and direct energy conversion.

Admission Requirements

It is important that applicants for admission to the College of Engineering complete successfully the full sequence of secondary school courses in English, mathematics, and science. The following subjects are required:

Subject	Units
English (4 years)	3
Physics and Chemistry	2
Algebra (through quadratics)	2
Plane Geometry and Trigonometry	1½
Other college preparatory subjects	4½
Electives, not more than	2
	<hr/> 15

GRADUATION REQUIREMENTS

Candidates for the Bachelor of Science degree must complete all of the prescribed work of the curriculum in which they seek to qualify. A total of 195 quarter hours (equivalent to 146 semester hours) is required for the degree. Students who undertake cooperative work assignments must meet the requirements of the Department of Cooperative Education before they become eligible for their degrees.

No student transferring from another college or university is eligible to receive the Bachelor of Science degree until he has completed at least one academic year at Northeastern immediately preceding his graduation.

Scholarship Requirements

The degree conferred not only represents the formal completion of the subjects in the selected course of study but also indicates professional competence in the designated field of specialization. Those who are clearly unable to meet the accepted standard of attainment will be required to withdraw from the University.

Graduation with Honor

Candidates of distinctly superior achievement in their academic work will be graduated with honor. Upon special vote of the faculty a limited number of this group may be graduated with high honor or with highest honor. Students must have been in attendance at the University at least six quarters before they may become eligible for honors at graduation.

Engineering Curricula

A brief description of each of the six engineering curricula, together with a short statement as to the principal vocational opportunities available to graduates, is given below to assist students in choosing their fields of specialization.

Civil Engineering Department

Ernest L. Spencer, Professor and Chairman, B.S., M.S., P.E. (Mass.)

Associate Professors

Leroy M. Cahoon, B.S., M.S.,
P.E. (Mass.)
John J. Cochrane, B.S., M.S.,
Ph.D., P.E. (Mass., N.Y.)
Joseph S. Firnkas, Ing., P.E.
(Mass. & N.Y.)
Alvin S. Goodman, B.S., M.S.,
Ph.D., P.E. (Mass., N.Y.)
Kenneth M. Leet, B.S., M.S.,
Ph.D., P.E. (Mass., Penn.)
Joseph H. Lenney, B.S., M.S.,
P.E. (Mass.)
Robert L. Meserve, B.S., M.S.,
P.E. (Mass.)
Saul Namyet, B.S., P.E. (Mass.,
N.Y.)

Associate Professors

Edward R. Pershe, B.S., M.S.,
Ph.D., P.E. (Ohio, Neb.)
C. Andrew Pretzer, B.S., M.S., Ph.D.
P.E. (Mass.)
Robert C. Stiefel, B.S., M.S., Ph.D.,
P.E. (Penn.)

Assistant Professors

Reginald Amory, B.S., M.S., Ph.D.
Lyle E. Branagan, B.S., M.S., P.E.
(Mass.)
William Domey, B.S., M.S., P.E.
(Mass.)
Constantine J. Gregory, B.A., M.S.,
Ph.D.
Walter E. Jaworski, A.S., B.S., M.S.

Civil Engineering has to do with the planning and building of all kinds of structures and public works. None of the structures of civil engineers lend themselves to quantity production in a factory. Not only are civil engineering works designed to fit a single location, but ordinarily their value is dependent upon their ability to resist forces tending to move them.

Civil engineering is as old as civilization itself and, until recent times, it embraced all phases of engineering except those of a military character. Today its major branches include topographical, municipal, railroad, highway, structural, hydraulic, and sanitary engineering. It covers land surveying, soil mechanics, the building of railroads, harbors, docks, and similar structures; the construction of sewers, water works, waste water treatment works, air pollution control, radiological health, public health, streets, and highways; the design and construction of flood control projects, bridges, buildings, walls, foundations, and of all fixed structures.

Since the first step in every civil engineering project involves accurate measurement of the surface features of the land, of the nature of the soil, and of the character of the underlying rock, the study of surveying and related subjects occupies a large place in the civil engineering curriculum. And since the primary consideration in designing any structure is to make certain that it will withstand safely any force to which it may be subjected, the mechanics of static bodies, strength of materials, and theory of structures are studied in detail. The curriculum is thus intended to prepare the young civil engineer to take up the work of design and construction of structures, to solve the problems of water supply and waste disposal in urban areas, and intelligently to undertake the supervision of work in allied fields of engineering and in general contracting.

Upon graduation, the young engineer may expect a period of apprenticeship either in the field, surveying and plotting, or in the office, over the drafting board. As experience is gained, the graduate is entrusted with greater responsibilities in actual design and supervision of construction. Those who prefer a roving existence should direct their ambitions toward private fields, while those who prefer a stable home and community life will seek opportunities in the public service of the Federal Government and the various states and municipalities.

Specimen Program in CIVIL ENGINEERING

Degree: B.S. in C.E. Accredited by the E.C.P.D.

FIRST YEAR

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
9.101	Graphic Sci.	3(2)	4	9.102	Graphic Sci.	2(2)	3	9.103	Graphic Sci.	2(2)	3
10.141	Calculus	4	4	10.142	Calculus	4	4	10.143	Calculus	4	4
11.101	Physics	3	3	11.102	Physics	3	3	11.103	Physics	3	3
12.111	Gen. Chem.	3	3	12.112	Gen. Chem.	3	3	12.113	Gen. Chem.	3	3
30.101	English	3	3	30.102	English	3	3	30.103	English	3	3
90.100	Intr. Eng.	1	0								

SECOND YEAR

QUARTER 4				QUARTER 5			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
1.110	Surveying I	3(3)	4	1.140	Struct. Mech. I	4	4
3.181	Elec. Eng. I	3	3	3.182	Elec. Eng. II	3	3
10.144	Calculus	4	4	10.145	Calculus	4	4
11.104	Physics	3	3	11.105	Physics	3	3
11.110	Physics Lab.	(3)	1	11.111	Physics Lab.	(3)	1
39.125	Economics	4	4	39.126	Economics	4	4

THIRD YEAR

QUARTER 6				QUARTER 7			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
1.111	Surveying II	4(3)	4	1.120	Fluid Mech. I	4	4
1.141	Struct. Mech. II	4	4	1.180	Materials	4	4
2.120	Thermodyn.	3	3	2.116	Mechanics B	4	4
10.146	Math. Analysis	3	3	10.147	Math. Analysis	3	3
	Liberal Elective	4	4		Liberal Elective	4	4

FOURTH YEAR

QUARTER 8				QUARTER 9			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
1.121	Fluid Mech. II	3	3	1.143	Struct. Anal. I	4	4
1.142	Struct. Mech. III	4	4	1.150	Conc. Design I	4	4
1.181	Conc. Test. Lab.	1(4)	4	1.172	Soil Mech.	3(3)	4
16.170	Geology	4	4	5.265	Fund. of		
	Liberal Elective	4	4		Eng. Econ.	3	2
					Liberal Elective	4	4

FIFTH YEAR

QUARTER 10				QUARTER 11 (Struct. Option)				QUARTER 11 (San. Eng. Option)			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
1.144	Struct. Anal. II	3	3	1.130	Hwy. & Cons.			1.130	Hwy. & Cons.		
1.151	Conc. Design II	3	3		Eng.	4	4		Eng.	4	4
1.160	Struct. Design I	4	4	1.145	Struct. Anal. III	3	3	1.191	San. Eng. II	4	4
1.190	San. Eng. I	4	4	1.161	Struct. Design II	3(3)	3	1.192	San. Eng. III	3(3)	4
29.102	Effec. Speaking	3	3	1.911	San. Eng. II	4	4	5.146	Basic Eng. Stat.	3	3
90.251	Placement Tech.	1	0		Liberal Elective	4	4		Liberal Elective	4	4

Mechanical Engineering Department

Arthur R. Foster, Professor and Chairman, B.S., M.Eng.

Professors

John F. Dunn, S.B., S.M., Sc.D.
 Melvin Mark, B.S., M.S., Sc.D.
 Welville B. Nowak, S.B., Ph.D.
 Joseph J. Zelinski, B.S., Ph.D.

Assistant Professors

William O. Bruehl, B.S.
 Thomas C. Coleman, Jr., B.S., M.S.
 Richard Madden, B.S., M.S., Ph.D.
 Ralph Sexton, B.S., M.S.

Associate Professors

Ralph S. Blanchard, Jr., B.S., M.S.
 Don A. Lautman, B.S., Ph.D.
 Bertram S. Long, B.S., M.S., M.E.
 Ernest E. Mills, B.S., M.S.
 Richard J. Murphy, B.S., M.S.,
 Ph.D.
 Warren G. Nelson, S.B., S.M., Sc.D.
 Thomas E. Phalen, Jr., B.S., M.S.
 Alvin J. Yorra, B.S., M.S.
 John Zotos, B.S., M.S.

Instructors

John H. Cashman, B.S., M.S.
 Juris Krumins, B.S., M.S.
 Andrew Levine, B.S., M.S.
 John C. O'Callahan, B.S., M.S.
 John Swanson, B.S., M.S.

II. Mechanical Engineering is concerned with the design, development, manufacture, and supervision of the efficient operation of machinery to both produce and consume power. The diversity of opportunities available to mechanical engineers makes it important for the curriculum to include a sound foundation in areas such as mechanics of solids and fluids, strength of materials, thermodynamics, heat transfer, and materials science. These engineering sciences are followed by applications such as vibrations and controls, machine design, laboratory projects, nuclear engineering, direct energy conversion, experimental stress analysis, materials processing, physical metallurgy, etc. A limited amount of specialization is possible in the senior year.

To optimize the performance of machines or complex systems the mechanical engineer makes increasing use of both analog and digital computers. Computers are essential for optimizing designs, computing system performance from test data, and using feedback techniques to attain control of a system.

With the explosion of knowledge mechanical engineers are involved in many new technologies such as the development of fluidics, direct energy conversion of heat to electricity (magnetohydrodynamics, thermoelectrics, thermionics, fuel cells, etc.), the application of numerical control to machine tools, design of space craft and their rocket engines, nuclear power plants, and the development of composite structural materials. There are also a multitude of opportunities in the more traditional areas of internal combustion engines, jet engines, heating and air conditioning, conventional power plants, machine tools, and special processing machinery. Even in these established industries new processes, new materials, and new design techniques provide a real challenge to the mechanical engineer's ingenuity.

For mechanical engineers whose abilities lie in the administrative direction, they may find themselves entrusted with increasing responsibility for the successful management of an industrial enterprise.

For superior students a **6 year BS-MS Program** may be elected. Graduate studies are started in the junior and senior years, partly in place of some undergraduate work, and partly as an overload. Enough graduate credits have been earned by the end of the senior year so that the 40 quarter hours required for the M.S. may be completed during a single additional year on the cooperative plan.

Specimen Program in MECHANICAL ENGINEERING

Degree: B.S. in M.E. Accredited by the E.C.P.D.

FIRST YEAR

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
9.101	Graphic Sci.	3(2)	4	9.102	Graphic Sci.	2(2)	3	9.103	Graphic Sci.	2(2)	3
10.141	Calculus	4	4	10.142	Calculus	4	4	10.143	Calculus	4	4
11.101	Physics	3	3	11.102	Physics	3	3	11.103	Physics	3	3
12.111	Gen. Chem.	3	3	12.112	Gen. Chem.	3	3	12.113	Gen. Chem.	3	3
30.101	English	3	3	30.102	English	3	3	30.103	English	3	3
90.100	Intr. Eng.	1	0								

SECOND YEAR

QUARTER 4				QUARTER 5			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
2.101	Mechanics I	4	4	2.102	Mechanics II	4	4
3.181	Elec. Eng. I	3	3	3.182	Elec. Eng. II	3	3
10.144	Calculus	4	4	10.145	Calculus	4	4
11.104	Physics	3	3	11.105	Physics	3	3
11.110	Physics Lab.	(3)	1	11.111	Physics Lab.	(3)	1
39.125	Economics	4	4	39.126	Economics	4	4

THIRD YEAR

QUARTER 6				QUARTER 7			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
2.103	Mechanics III	4	4	2.104	Mechanics IV	4	4
2.121	Thermodyn. I	4	4	2.122	Thermodyn. II	4	4
2.160	M.E. Lab. I	2(3)	4	2.141	Material Sci.	3(3)	4
10.146	Math. Analysis	3	3	10.147	Math. Analysis	3	3
	Liberal Elective	4	4		Liberal Elective	4	4

FOURTH YEAR

QUARTER 8				QUARTER 9			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
1.148	Structures	3	3	2.106	Fluid Mech. II	4	4
2.105	Fluid Mech. I	3	3	2.124	Heat Transfer	4	4
2.123	Applied Thermo.	4	4	2.161	M.E. Lab. II	(4)	3
2.142	Materials & Pro.	4(2)	5	5.245	Stat.		
	Liberal Elective	4	4		Probability	4	4
					Liberal Elective	4	4

FIFTH YEAR

QUARTER 10				QUARTER 11			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
2.107	Vibration & Cont.	4	4	2.109	Machine Design	4	4
2.108	Design Fund.	4	4	2.126	Thermodyn. III	4	4
2.125	Nuclear Eng.	3(2)	4		or		
2.162	M.E. Lab. III	(4)	3	2.214	Exper. Stress Anal.	4	4
29.102	Eff. Speaking	3	3	2.127	Direct Eng. Conv.	4	4
90.251	Placement Tech.	1	0		or		
				2.232	Phys. Metallurgy	4	4
				5.144	Quality Control	3	3
					or		
				5.184	Ind. & Labor Rel.	3	3
					or		
				5.265	Eng. Economy	3	3
					Liberal Elective	4	4

SIX-YEAR OPTION (continued on following page)

MECHANICAL ENGINEERING

SIX-YEAR OPTION (continued)

QUARTER 10			
No.	Course	Cl. Q.H.	
2.108	Design. Fund.	4	4
2.125	Nuclear Eng.	3(2)	4
2.801	Continuum Mech.	2	2
2.862	Systems	4	4
10.806	Grad. Math.	4	4
29.102	Eff. Speaking	3	3
90.251	Placement Tech.	1	0

QUARTER 12			
No.	Course	Cl. Q.H.	
	3 Electives	12	12
2.991	Thesis		5

QUARTER 11			
No.	Course	Cl. Q.H.	
2.109	Machine Design	4	4
2.126	Thermodyn. III	4	4
	or		
2.127	Direct Energy Conv.	4	4
2.214	Exp. Stress Anal.	4	4
	or		
2.232	Phys. Metallurgy	4	4
	or		
2.903	Adv. Thermodyn.	4	4
2.990	Seminar	1	1
2.802	Continuum Mech.	2	2
5.144	Quality Control	3	3
	or		
5.265	Eng. Economy	3	3
	or		
5.184	Ind. & Labor Rel.	3	3
	Liberal Elective	4	4

QUARTER 13			
No.	Course	Cl. Q.H.	
	3 Electives	12	12
2.990	Seminar	1	1
2.991	Thesis		5

Electrical Engineering Department

Harold R. Raemer, Professor and Chairman, B.S., M.S., Ph.D.

Professors

Sze-Hou Chang, B.S., M.S., Ph.D.
 Laurence F. Cleveland, B.S., M.S.
 Bell A. Cogbill, B.S., M.S.
 Ladislav Dolansky, Ing., S.M., E.E.,
 Ph.D.
 Benjamin M. Rabinovici, Ing. Dipl.
 E.E., M.S.E.E., Dr. Sc.
 Wilfred J. Remillard, B.S., M.S.,
 Ph.D.
 J. Spencer Rochefort, B.S., M.S.
 Robert D. Stuart, M.A., Ph.D.,
 C.Eng.

Assistant Professors

Robert M. Duff, B.S., M.A.
 Robert A. Gonsalves, B.S., M.S.,
 Ph.D.
 Martin S. Levetin, B.S., M.S., Ph.D.
 Robert N. Martin, B.S., M.S.
 Lawrence J. O'Connor, B.S., M.S.
 Meng Chi Tsen, B.S., M.S.
 Lih-Jyh Weng, B.S., M.S., Ph.D.

Associate Professors

Ralph E. Bach, Jr., B.S., M.S.,
 Ph.D.
 Marcello Carrabes, B.S., M.S.
 Basil L. Cochrun, B.S., M.S.
 James M. Feldman, B.S., M.S.,
 Ph.D.
 Arvin Grabel, B.S., M.S., Sc.D.
 Wayne G. Kellner, B.S., S.M., Sc.D.
 Walter H. Lob, B.S., M.S.
 Morton Loewenthal, B.S., Ph.D.
 Louis J. Nardone, B.S., M.S.
 Charles A. Renton, B.S., Ph.D.
 Sheldon S. Sandler, B.S., M.A.,
 Ph.D.
 Martin Schetzen, B.S., S.M., Sc.D.
 Walter S. Schwab, S.B., S.M.,
 Ph.D.
 Jacob Wiren, B.S., M.S.

Instructors

Richard A. Bean, B.S., M.S.
 Hi D. Chai, B.S., M.S.
 Gordon F. Currin, B.S., M.S.
 Joseph K. DeRosa, B.S., M.S.
 Thomas W. Glynn, B.S., M.S.
 Hooshang Mahdi, M.E., M.S.
 Nathan D. Phillips, B.S., M.S.
 Peter A. Schnieper, B.S.
 Chester Stanhope, B.S., M.S.
 Elwood Streeter, B.S.

Electrical Engineering is a fast-moving field, obtaining much of its impetus from the contemporary pioneering developments in the pure sciences. For this reason, the program of study in electrical engineering includes more work in physics and mathematics than do the other programs and provides a solid grounding in engineering fundamentals as well.

Electrical engineering today embraces a continually widening sphere of activity. It ranges in scope from laboratory and theoretical studies in applied physics to the economic design of communications and energy systems, serving not only the land-based requirements of entire continents but also the needs of space exploration.

Because electrical properties, concepts, instrumentation, and control are basic to much of modern technology, the electrical engineer is often engaged in interdisciplinary activities. Examples are biomedical electronics, electro-optics, and machine translation of languages.

The profession of electrical engineering affords a wide diversification of employment opportunities. If one is research-minded, opportunity to develop one's talents may be found in one of the great university or industrial laboratories; if one is interested in industrial applications or plant problems, opportunity can be found in the manufacturing or operating organizations; and if one is sales-minded, he may find a career as a sales engineer.

Specimen Program in ELECTRICAL ENGINEERING

Degree: B.S. in E.E. Accredited by the E.C.P.D.

FIRST YEAR

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
9.101	Graphic Sci.	3(2)	4	9.102	Graphic Sci.	2(2)	3	9.103	Graphic Sci.	2(2)	3
10.141	Calculus	4	4	10.142	Calculus	4	4	10.143	Calculus	4	4
11.101	Physics	3	3	11.102	Physics	3	3	11.103	Physics	3	3
12.111	Gen. Chem.	3	3	12.112	Gen. Chem.	3	3	12.113	Gen. Chem.	3	3
30.101	English	3	3	30.102	English	3	3	30.103	English	3	3
90.100	Intr. Eng.	1	0								

SECOND YEAR

QUARTER 4				QUARTER 5			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
2.101	Mechanics I	4	4	2.102	Mechanics II	4	4
3.111	Circuit Th. I	3	3	3.112	Circuit Th. II	3	3
10.144	Calculus	4	4	10.145	Calculus	4	4
11.104	Physics	3	3	11.105	Physics	3	3
11.110	Physics Lab.	(3)	1	11.111	Physics Lab.	(3)	1
39.125	Economics	4	4	39.126	Economics	4	4

THIRD YEAR

QUARTER 6				QUARTER 7			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
2.117	Mechanics C	3	3	2.120	Thermodyn.	3	3
3.113	Circuit Th. III	3	3	3.121	Sigs. & Sys. I	3	3
3.131	E.E. Lab. I	(3)	3	3.132	E.E. Lab. II	(3)	3
10.146	Math. Analysis	3	3	3.141	Electronics I	3	3
11.140	Solid St. Elect.	3	3	10.147	Math. Analysis	3	3
	Liberal Elective	4	4		Liberal Elective	4	4

FOURTH YEAR

QUARTER 8				QUARTER 9			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
3.122	Sigs. & Sys. II	3	3	3.114	Circ. & Waves	3	3
3.133	E.E. Lab. III	(3)	3	3.134	E.E. Lab. IV	(3)	3
3.142	Electronics II	3	3	3.143	Electronics III	3	3
3.161	Field Theory I	3	3	3.162	Field Theory II	3	3
5.265	Eng. Economics	3	3	3.171	Energy Conv. I	3	3
	Liberal Elective	4	4		Liberal Elective	4	4

FIFTH YEAR

QUARTER 10				QUARTER 11			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
3.123	Control Sys.	3	3	1.126	Fluid Mechs.	3	3
3.135	E.E. Lab. V	(3)	3	3.136	E.E. Lab. VI	(3)	3
3.151	Comm. Theory	3	3	3.173	Energy Conv. III	3	3
3.163	Field Th. III	3	3	29.102	Effec. Speaking	3	3
3.172	Energy Conv. II	3	3		Liberal Elective	4	4
	E.E. Elective	3	3*		E.E. Elective	3	3**
90.251	Placement Tech.	1	0				

*3.221, 3.292, or 2.143.

**3.215, 3.222, 3.241, 3.291, or 3.293.

Specimen Program in ELECTRICAL ENGINEERING POWER SYSTEMS

Degree: M.S. in E.E.

FIRST YEAR

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
9.101	Graphic Sci.	3(2)	4	9.102	Graphic Sci.	2(2)	3	9.103	Graphic Sci.	2(2)	3
10.141	Calculus	4	4	10.142	Calculus	4	4	10.143	Calculus	4	4
11.101	Physics	3	3	11.102	Physics	3	3	11.103	Physics	3	3
12.111	Gen. Chem.	3	3	12.112	Gen. Chem.	3	3	12.113	Gen. Chem.	3	3
30.101	English	3	3	30.102	English	3	3	30.103	English	3	3
90.100	Intr. Eng.	1	0								

SECOND YEAR

QUARTER 4				QUARTER 5			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
2.101	Mechanics I	4	4	2.102	Mechanics II	4	4
3.111	Circuit Th. I	3	3	3.112	Circuit Th. II	3	3
10.144	Calculus	4	4	10.145	Calculus	4	4
11.104	Physics	3	3	11.105	Physics	3	3
11.110	Physics Lab.	(3)	1	11.111	Physics Lab.	(3)	1
39.125	Economics	4	4	39.126	Economics	4	4

THIRD YEAR

QUARTER 6				QUARTER 7			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
2.117	Mechanics C	3	3	2.120	Thermodyn.	3	3
3.113	Circuit Th. III	3	3	3.121	Sigs. & Sys. I	3	3
3.131	E.E. Lab. I	(3)	3	3.132	E.E. Lab. II	(3)	3
10.146	Math. Analysis	3	3	3.141	Electronics I	3	3
11.140	Solid St. Elect.	3	3	10.147	Math. Analysis	3	3
	Liberal Elective	4	4		Liberal Elective	4	4

FOURTH YEAR

QUARTER 8				QUARTER 9			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
2.128	Thermo-dynamics	3	3	3.114	Circ. & Waves	3	3
3.122	Sigs. & Sys. II	3	3	3.143	Electronics III	3	3
3.133	E.E. Lab. III	(3)	3	3.162	Field Theory II	3	3
3.142	Electronics II	3	3	3.171	Energy Conv. I	3	3
3.161	Field Theory I	3	3	3.234	E.E. Lab.	(3)	3
5.265	Eng. Economics	3	3	10.831	Probability	2	2*
	Liberal Elective	4	4		Liberal Elective	4	4

FIFTH YEAR

QUARTER 10				QUARTER 11			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
3.123	Control Systems	3	3	1.126	Fluid Mechanics	3	3
3.172	Energy Conv. II	3	3	3.173	Energy Conv. III	3	3
3.221	Elect. Energy Systems & Sources I	3	3	3.222	Elect. Energy Systems & Sources II	3	3
3.235	E.E. Lab.	(3)	3	3.236	E.E. Lab.	(3)	3
10.806	Advanced Math.	4	4*	4.146	Nuclear Eng.	3	3
	Liberal Elective	4	4		Liberal Elective	4	4

*Graduate Course

ELECTRICAL ENGINEERING POWER SYSTEMS (continued)**SIXTH YEAR**

QUARTER 12				QUARTER 13			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
3.928	Analysis of Power Circ.	4	4*	3.931	Power Systems Planning	4	4*
3.980	Seminar I	2	2*	3.981	Seminar II	2	2*
3.986	Thesis or Elective Electives	4 6	4* 6*	3.986	Thesis or Elective Electives	4 8	4* 8*

*Graduate Course

Chemical Engineering Department

Ralph A. Troupe, Professor and Chairman, B.S., M.S., Ph.D., P.E. (Mass., Tex.)

ProfessorsCharles S. Keevil, S.B., S.M.,
Sc.D., P.E. (Mass., Cal.)**Associate Professors**Bernard M. Goodwin, B.S., Sc.D.
Richard R. Stewart, B.S., M.S.,
Ph.D.**Assistant Professors**Ralph A. Buonopane, B.S., M.S.,
Ph.D.
John G. Miserlis, B.S., M.S.
Charles E. Speight, B.S., M.S.
John A. Williams, B.S., M.S., Ph.D.**Instructor**

Elliot Weisman, B.S., M.S.

Chemical Engineering has grown out of the discoveries in the chemical laboratories which have served as a foundation for a great many new industries whose production processes involve chemical as well as physical changes. Petroleum refining, coal carbonization, plastics, manufacture of nylon and cellophane, and hundreds of other industries require men and women trained in chemistry as well as in engineering. Moreover, much of the training received by the chemical engineer is now being applied in the rapidly developing field of nuclear engineering. Many older industries, such as foods, textiles, paints and varnishes, and leather, are also employing chemical engineers.

The chemical engineer has been defined as a "professional man experienced in the design, construction, and operation of plants in which materials undergo chemical and physical change." It is the task of the chemical engineer to reduce the costs, increase production, and improve the quality of the products in the industry.

In addition to the fundamental courses in chemistry, mathematics, and physics required of all engineering students, a considerable amount of time is devoted to more advanced work in chemistry as a foundation for the study of chemical technology. In recognition of the increasing interest in the production and utilization of nuclear energy, a course in modern physics and a course in the introduction to nuclear engineering recently have been added to the curriculum. Instruction in the elements of mechanical and electrical engineering also helps to give the student a sound engineering background. Since the field of chemical engineering is so varied, the curriculum has been designed to give the students a broad training in which fundamental principles are stressed. It is believed that this training will enable the students to acclimate themselves readily to whatever industry they may choose to enter.

Because of the complex nature of many chemical processes and because of the difficulty of translating laboratory results into full-scale plant operations, there has been developed in many chemical plants the so-called semi-works or pilot plant. Here new processes developed by the chemists in the research laboratory are put to the test of actual plant conditions. And it is here that the young chemical engineers often find themselves upon graduation. If they are able to understand the chemist on the one side and the plant operator on the other, and if they are technically competent as well, they will soon find opportunities for advancement either in one of the technical branches of the industry, such as design, development, research, and production; or in the sales and management fields in which a knowledge of chemical engineering is essential.

Specimen Program in CHEMICAL ENGINEERING

Degree: B.S. in Ch.E. Accredited by the E.C.P.D.

FIRST YEAR

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
9.101	Graphic Sci.	3(2)	3	9.102	Graphic Sci.	2(2)	3	9.103	Graphic Sci.	2(2)	3
10.141	Calculus	4	4	10.142	Calculus	4	4	10.143	Calculus	4	4
11.101	Physics	3	3	11.102	Physics	3	3	11.103	Physics	3	3
12.111	Gen. Chem.	3	3	12.112	Gen. Chem.	3	3	12.116	Gen. Chem.	3(3)	4
30.101	English	3	3	30.102	English	3	3	30.103	Englsih	3	3
90.100	Intr. Eng.	1	0								

SECOND YEAR

QUARTER 4				QUARTER 5			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
4.101	Chem. Eng.			4.102	Chem. Eng.		
	Calc. I	3(3)	4		Calc. II	3	3
10.144	Calculus	4	4	4.104	Com. Chem. Dev.	3	3
11.104	Physics	3	3	10.145	Calculus	4	4
11.110	Physics Lab.	(3)	1	11.105	Physics	3	3
12.147	Org. Chemistry	4(3)	5	11.111	Physics Lab.	(3)	1
				12.148	Org. Chemistry	4(3)	5

THIRD YEAR

QUARTER 6				QUARTER 7			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
2.115	Mechanics A	4	4	2.118	Mechanics D	4	4
4.111	Chem. Eng. I	3	3	4.112	Chem. Eng. II	3	3
10.146	Math. Analysis	3	3	10.147	Math. Analysis	3	3
12.161	Phys. Chemistry	4(3)	5	12.162	Phys. Chemistry	4(3)	5
	Liberal Elective	4	4		Liberal Elective	4	4

FOURTH YEAR

QUARTER 8				QUARTER 9			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
4.121	Trans. Phenom. I	4	4	4.122	Trans. Phenom. II	4	4
4.125	Materials Sci.	4	4	4.124	Exp. Methods II	2(4)	4
4.123	Exp. Methods I	2(4)	4	4.126	Chem. Eng.		
39.125	Economics	4	4		Thermo.	4	4
	Liberal Elective	4	4	39.126	Economics	4	4
					Liberal Elective	4	4

FIFTH YEAR

QUARTER 10				QUARTER 11			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
3.181	Elect. Eng. I	3	3	3.182	Elect. Eng. II	3	3
4.131	Process Design	1(6)	7	4.132	Process Design	1(6)	7
	or				or		
4.133	Projects	1(6)	7	4.134	Projects	1(6)	7
4.135	Intr. Nuclear			4.136	Chem Eng. Kin.	4	4
	Eng.	4	4		Liberal Elective	4	4
29.102	Effec. Speaking	3	3				
90.251	Placement Tech.	1	0				

Industrial Engineering Department

James M. Moore, Professor and Chairman, B.M.E., M.S., P.L.D.

Professor

Austin W. Fisher, Jr., B.S., Sc.D.

Assistant Professors

John F. Buoncristiani, B.S., M.S.,
Ph.D.

Stewart V. Hoover, B.S., M.S.

David R. Hall, B.S., M.S.

Associate Professors

David R. Freeman, B.S., M.S.,
Ph.D.

Thomas E. Hulbert, B.S., M.S.,
P.E. (Mass.)

V. Industrial Engineering is concerned with the application of engineering and scientific principles to the varied problems in the field of production management involving the intelligent utilization of men, materials, machines, and money.

About sixty years ago, Frederick W. Taylor undertook to apply to the problems of industrial management what we now call "the scientific method" or "the engineering approach." He reasoned that it was management's business to know what constituted a proper day's work and that the way to get the facts was through research and experiment on a scientific basis. He defined "scientific management" not as any device or scheme or gadget, but as a new outlook — a new viewpoint based upon a solid foundation of fact. The methods employed by Taylor and by those who came after him have undergone some modification, but the concept of scientific management which he formulated has gained wider and wider recognition from both employers and employees.

This growing recognition of the value of a scientific approach to the problems of industrial management soon created a demand for men and women trained in engineering and science, who possessed a knowledge of business as well, to assume positions of administrative responsibility in industry. To meet this demand, courses were established in many engineering colleges to provide a thorough training in engineering fundamentals, together with a specialized training in business administration which would prepare the students for managerial responsibilities in technical industries. These curricula are variously entitled industrial engineering, administrative engineering, and engineering administration, and all are designed to lead ultimately to positions of administrative or executive responsibility, rather than to positions which involve highly specialized technical engineering responsibility.

Upon graduation, the young industrial engineer may find his way into such factory staff departments as methods engineering, production planning and control, wage administration, quality control, and time study. If he prefers, he may select work in cost accounting or statistical analysis; or he may incline towards sales engineering activity and serve in the field as a sales and service representative.

More and more there is opportunity for the experienced industrial engineer to serve industry in a consulting capacity. Upon becoming especially skilled in his profession, he is called in by industry for assistance in the installation and maintenance of sound management principles, and in the reorganization of enterprises which have failed.

Specimen Program in INDUSTRIAL ENGINEERING

Degree: B.S. in I.E. Accredited by the E.C.P.D.

FIRST YEAR

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
9.101	Graphic Sci.	3(2)	4	9.102	Graphic Sci.	2(2)	3	9.103	Graphic Sci.	2(2)	4
10.141	Calculus	4	4	10.142	Calculus	4	4	10.143	Calculus	4	3
11.101	Physics	3	3	11.102	Physics	3	3	11.103	Physics	3	3
12.111	Gen. Chem.	3	3	12.112	Gen. Chem.	3	3	12.113	Gen. Chem.	3	3
30.101	English	3	3	30.102	English	3	3	30.103	English	3	3
90.100	Intr. Eng.	1	0								

SECOND YEAR

QUARTER 4				QUARTER 5			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
41.201	Accounting	4	4	5.260	Engineering Econ.	4	4
10.144	Calculus	4	4	10.145	Calculus	4	4
11.104	Physics	4	4	11.105	Physics	4	4
39.115	Liberal Arts (Econ.)	4	4	39.116	Liberal Arts (Econ.)	4	4

THIRD YEAR

QUARTER 6				QUARTER 7			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
2.115	Mechanics	4	4		Engineering Science Elective*	4	4
3.183	Elect. Engr. Theory I	4	4	5.147	Statistics I	4	4
10.208	Math. (Probability)	4	4	10.146	Math. Anal.	4	4
	Liberal Arts	4	4		Liberal Arts	4	4
29.	Public Speaking	4	4				

FOURTH YEAR

QUARTER 8 [‡]				QUARTER 9 [‡]			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
1.124	Flow of Fluids	4	4	2.121	Thermodynamics I	4	4
5.148	Statistics II	4	4	5.163	Operations Research II	4	4
5.161	Operations Research I	4	4		I.E. Elect.	4	4
	Liberal Arts (Behavioral)	4	4		Liberal Arts (Behavioral)	4	4

FIFTH YEAR

QUARTER 10 [‡]				QUARTER 11 [‡]			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
5.130	Systems I	4	4	5.131	Systems II	4	4
5.186	Personnel & Organ.	4	4		I.E. Elective	4	4
	Engineering Elective	4	4		Engineering Elect.	4	4
	Non-Engr. Elect.**	4	4		Non-Engr. Elec.**	4	4
90.251	Placement Tech.	1	1				

*Students must elect a basic engineering science from the following:

- 3.184 Electrical Engr. Theory II 4
- 2.118 Mechanics II 4
- 2.141 Materials & Metallurgy 4

[‡] Advanced student may take an additional elective as overload with approval of his adviser in these quarters.

**May be in any college other than Engineering with Adviser's approval.

Biophysics and Biomedical Engineering Department

Samuel Fine, Professor and Chairman, B.A., S.M., M.D.

VI. Biophysics and Biomedical Engineering is concerned with the scientific principles underlying the physical and biological sciences and their application to problems of biological significance. Research in biology and medicine for our immediate environment, for the exploration of extraterrestrial space, and for marine biology has placed very stringent requirements on the knowledge, understanding, and performance of the physical scientist engaged in these investigations. The scientific methods and techniques of the physical scientists are being applied to an increasing extent to problems in the biological sciences.

Fields of endeavor which involve bioengineers and biophysicists include:

1. Design, development, and application of instrumentation for biological studies, including electrocardiographs, radioelectrocardiographs, electron microscopes, ultra-centrifuge units, pH equipment, electrophoresis apparatus, nuclear instrumentation, specialized microscopes, and laser units.
2. Characterization of biological systems by suitable models, including models of the heart, the neuron, simulation of cardiac or respiratory action on a computer, and design and analysis of adaptive systems.
3. Contributions to the solution of basic biological problems, including cell growth, cell division, cell differentiation, carcinogenesis, interaction of radiation, both electromagnetic and particulate with living tissue, and transmission of information within the biological system, and between the biological system and its environment.
4. Application of physical systems to medical diagnosis, care, and therapy, including the application of equipment of the first group, as well as X-ray equipment, monitoring equipment in anaesthesiology, surgery and on the hospital wards, the use of computers in electrocardiographic and other data analysis, the use of electromagnetic radiation, particle radiation and ultrasonics, and maintenance of satisfactory ecological systems.
5. Investigation of biological systems to assist in understanding physical systems, including study of the flight of bats involving ultrasonic radar, the sensing systems of electric fish, the flight of birds and the infrared detection systems of reptiles.

The program of study is an honors program which includes courses in the biological sciences, the physical sciences, and the humanities. Basic courses in biology, mathematics, and physics are at the level taught to individuals majoring in these areas. The basic principles learned are applied to courses in molecular and cellular biology, human physiology, and the engineering sciences. Courses in biophysics and biomedical engineering emphasize the application of physical techniques and methods to the solution of biological problems.

During the cooperative work period, the student will be able to familiarize himself with laboratory research and development. An undergraduate thesis based on work carried out during the cooperative work period or at the University is required.

Education in biophysics and biomedical engineering provides a sound foundation for future studies toward a doctorate in medicine or dentistry, or a career as a research scientist in a university, hospital, or government agency such as the National Aeronautics and Space Administration or the Department of Health, Education, and Welfare. Industrial organizations interested in space-oriented or biomedically oriented research are also seeking individuals with qualifications in these areas. Other career opportunities include the marine sciences, the psychological sciences, and public health.

Specimen Program in BIOPHYSICS AND BIOMEDICAL ENGINEERING

Degree: B.S. in Engineering Biophysics

FIRST YEAR

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
9.111	Comp. Prog.	1 0	9.112	Comp. Prog.	1 0	9.113	Comp. Prog.	1 1
10.201	Calculus	5 5	10.202	Calculus	5 5	10.203	Algebra	5 5
11.151	Physics	3 3	11.152	Physics	3 3	11.153	Physics	3 3
12.131	Chemistry	3(3) 4	12.132	Chemistry	3(3) 4	12.133	Chemistry	3(3) 4
18.111	Gen. Biol.	2(3) 3	18.112	Gen. Biol.	2(3) 3	18.113	Gen. Biol.	2(3) 3
30.101	English	3 3	30.102	English	3 3	30.103	English	3 3
90.100	Intr. Eng.	1 0						

SECOND YEAR

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
3.111	Circuit Th. I	3 3	3.112	Circuit Th. II	3 3
10.204	Calculus	4 4	10.205	Calculus	4 4
11.110	Physics Lab.	(3) 1	11.111	Physics Lab.	(3) 1
11.154	Physics	4 4	11.155	Physics	4 4
12.147	Org. Chem.	4(3) 5	12.148	Org. Chem.	4(3) 5
39.125	Economics	4 4	39.126	Economics	4 4

THIRD YEAR

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
3.113	Circuit Th. III	3 3	2.141	Mat'l Sci. (with biomed appl.,	3(4) 5
3.131	E.E. Lab.	(3) 1	3.121	Sigs. & Sys.	3 3
10.146	Math. Anal.	3 3	3.141	Electronics	3 3
11.140	Solid St. Elect.	3 3	10.147	Math. Anal.	3 3
73.234	Biochemistry	4(3) 5	11.220	Thermodyn. & Kin. Th.	4 4
	Liberal Elective	4 4		Liberal Elective	4 4

FOURTH YEAR

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
3.122	Sigs. & Sys. II	3 3	3.132	E.E. Lab. II	(3) 3
3.142	Electronics II	3 3	3.143	Electronics III	3 3
4.111	Chem. Eng. Sci. I	3 3	4.112	Chem. Eng. Sci. II	3 3
	or			or	
11.210	Elec. & Mag.	3 3	10.208	Probability	4 4
18.258	Cell Physiol.	3(3) 4	18.259	Cell Physiol.	3(3) 4
	Biophysics	3 3*		Biophysics	3 3*
	Intr. to Bioeng.	1 1*		Intr. to Bioeng.	1 1*
	Liberal Elective	4 4		Liberal Elective	4 4

FIFTH YEAR

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
4.113	Chem. Eng. Sci. III	4 4	10.208	Probability or	4 4
	or		11.212	Elec. & Mag.	4 4
11.211	Elec. & Mag.	4 4	11.240	Quantum I	4 4
11.230	Mod. Physics	4 4		Liberal Elective	3 3
	E.E. Lab. (special)	(3) 2		Human Physiol.	3 3*
	Human Physiol.	3 3*		Bioengineering & Biophysics Lab.	(3) 2
	Bioengineering & Biophysics Lab.	(3) 2		Bioengineering Thesis	3 3*
	Bioengineering Thesis	(3) 3			(3) 3

*Courses not presently offered at the University.

Graphic Science Department

Wilfred P. Rule, Professor and Chairman, B.S., M.S.

Associate Professors

Franklyn K. Brown, B.S., M.Ed.
Borah L. Kreimer, B.S., Ed.M.
Robert S. Lang, B.S., Ed.M.
Kenneth S. Woodward, B.S.

Instructors

E. Richard Artus, B.S.
Charles A. Garniewicz, B.S., M.S.
Walter D. Herrick, B.S.
John P. Kopecki, B.S., M.Ed.
K. Endre Toth, S.B.
Melvin White, B.S.

The Department of Graphic Science is primarily responsible for giving the first year engineering student a first involvement with engineering and confronts him with some of the typical problems he will encounter in his professional career. Some facility with the fundamental tools of engineering are developed by completion of courses in Computer Programming, Engineering Graphics and Introduction to Engineering and Design. Case studies involving problems in several engineering disciplines are analyzed and used to give the student a comprehensive view of engineering in general and examines some of its special characteristics. As such it is a service department preparing the student for his later courses and professional career.

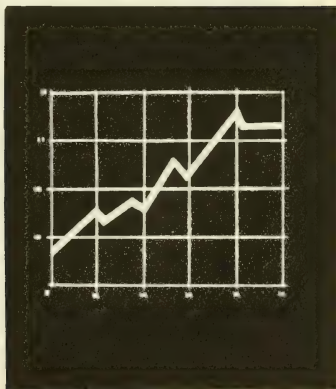
In addition to preparing the engineering freshman, the Department offers upper-class courses in the College of Liberal Arts, Education and Business Administration.



College of Business Administration

James S. Hekimian, Dean

John A. Palmucci, Assistant Dean



Programs of Study

The College of Business Administration offers programs of study in the principle fields of business leading to the degree of Bachelor of Science in Business Administration. The programs encompass the major fields of the professions of Management and Management Science. Majors are offered in the following five areas: Accounting, Finance & Insurance, Industrial Relations, Management, and Marketing. These programs are offered on the five-year Co-operative Plan, under which students gain substantial practical experience in the fields for which they are preparing as an integral part of their undergraduate course of study.

The Graduate School of Professional Accounting is also sponsored by the College of Business Administration. Designed specifically for Liberal Arts and other non-accounting majors, the School was established to help satisfy the accounting profession's need for persons with a broad liberal education in a high-quality professional program. The distinctive feature of the 15-month program—a 3-month internship with a public accounting firm—is in keeping with the basic philosophy of Northeastern.

The Master of Business Administration program is primarily a professional school in which the major objective is to develop practitioners of business administration. Most men and women who are enrolled presently are at the same time employed in various public and private organizations. These student-practitioners are working toward their degree on a part-time basis.

In addition, the Graduate School of Business Administration offers a Management Intern Program. Following the philosophy that a balanced exposure to theory and practice is the most effective approach to Management education, the two-year program affords excellent opportunity in each area. Interwoven with the regular academic terms are two periods of guided experience in business and other organizations. One period is of three months duration, the other six months. The job experience places the Management intern in a situation in which he must perform as he would in any organization. The nature of the job will assure him ample opportunity to observe, research, and report upon some aspect, element, or problem of the organization.

The College also sponsors a Center for Management Development, which annually conducts an intensive program designed to provide professional growth for middle management executives who will ultimately be called upon to carry broader executive responsibilities. The program of instruction, based on modification of the Northeastern Cooperative program, permits the participants to maintain their job responsibilities during the six-month period of the course.

The Bureau of Business and Economic Research is concerned particularly with problems of the New England Region, and is an integral part of the College. The Bureau conducts research projects under faculty leadership and supervision, with the assistance of undergraduate and graduate cooperative students as research assistants.

Policy

The College of Business Administration offers programs of study to prepare men and women for positions of administrative responsibilities in business, governmental, and other organizations. Preparation for administrative positions requires a subtlety of mind in the recognition and solution of problems. In order to accomplish this, the business student is given a broad understanding of business and organizational problems as well as first hand knowledge of effective methods of solving them. In addition, the broader scope of the business firm must be understood—especially its role and responsibility to the community and to the country.

To accomplish these objectives, the fundamental skills and tool subjects are dealt with in their relations to the broader context of the business firm. The Upperclass programs of study assimilate the principles of modern business management and administration and integrate these with courses in Liberal Arts.

The courses in each curriculum fall into four broad categories. (1) Required Liberal Arts Courses. (2) Business Administration core courses. (3) Business Administration courses required in one or more curricula, and (4) electives which may be taken in either Business Administration or Liberal Arts subjects provided that the proper over all proportion between the two is maintained.

Aims

In keeping with the current trends in collegiate education, the educational policy of the College has the following aims. First: to develop attitudes and ideals that are ethically sound and socially desirable. Second: to develop an appreciation of the social, political, and economic developments to which the business firm must adjust and adapt. Third: to develop that habits of accurate thinking that are essential to sound judgment. Fourth: to provide an opportunity to develop a specialization in business in accordance with the students' interests and talents. The Cooperative Plan is particularly helpful in this respect.

Accreditation

The Undergraduate Program of the College of Business Administration is fully accredited by the American Association of Collegiate Schools of Business.

Methods of Instruction

In the accomplishment of these aims, the College makes use of the lecture and recitation systems and the problem and case methods of instruction.

Introductory and basic tool courses are, for the most part, presented on a lecture-problem basis. A large proportion of the classwork of the upper-class years consists of discussion, analysis, and reports on specific business problems and cases.

Students are encouraged to analyze propositions, to challenge unsupported assertions, to think independently, and to support their thinking with logic and facts. Frequent verbal and written reports are required.

Admission Requirements

Applicants to the College of Business Administration must be graduates of college preparatory programs of study. The following subjects are prescribed as entrance requirements:

Subject	Units
English (4 years)	3
Mathematics	3
Science	1
Other college preparatory subjects	6
Electives, not more than	2
	<hr/> 15

GRADUATION REQUIREMENTS

Students may qualify for the degree of Bachelor of Science in Business Administration in one of the following areas of concentration: accounting, finance and insurance, industrial relations, management, and marketing.

Candidates for the Bachelor of Science degree must complete all of the prescribed work of the curriculum in which they seek to qualify. This usually totals 178 quarter hours credit including two quarter hour credits in physical education. Students who undertake cooperative work assignments must also meet the requirements of the Department of Cooperative Education before they become eligible for their degrees.

The final three quarters immediately preceding graduation must be completed in residence at Northeastern.

Scholarship Requirements

The degree conferred not only represents the formal completion of the subjects in the selected course of study but also indicates professional competence in the designated area of concentration. An over-all average grade of C is required for graduation.

Graduation with Honor

Candidates who have achieved distinctly superior attainment in their academic work will be graduated with honor. Upon special vote of the faculty a limited number of this group may be graduated with high honor or with highest honor. Students must have been in attendance at the University at least six quarters before they may become eligible for honors at graduation.

THE PROGRAMS OF STUDY

First Year

The 36 weeks of the freshman year are primarily devoted to a survey of the political and social institutions that underlie the conduct of business. In addition, accounting, English, and mathematics are given important positions in the program of this first year because of their fundamental significance as tools of communication for the businessman.

Other courses are provided to enrich the student's background in such fields as the physical sciences and the cultural foundations of our civilization.

In addition to regularly scheduled orientation meetings with the Dean of Freshmen, throughout the freshman year each student has the friendly counsel and guidance of a faculty adviser whose aim is to help bridge the gap between high school and college.

Upper-Class Years

Under the Northeastern five-year Cooperative Plan, the alternation of work and classroom study starts with the second year. During this year all students continue with a common program, a major portion of which is devoted to courses which are introductory to the functional areas of business operation.

At the end of the second year, at the close of Quarter 5, students formally elect their areas of concentration in accordance with their individual interests and aptitudes. To help make this choice a student may obtain professional advice in Northeastern's Counseling and Testing Center.

During the remaining three years, specific required courses are taken in the area of concentration elected by each student in addition to a common core of course work in the liberal arts and general business.

A brief statement of the nature of the vocational opportunities in the various fields follows. It is well for the prospective student to observe that employment after graduation and success in the business world are seldom determined solely by the student's chosen area of concentration.

Accounting Department

Joseph M. Golemme, Professor and Chairman, S.B., M.A., C.P.A.

Professors

Ralph C. Jones, B.S., M.S., Ph.D.,
C.P.A.
Lawrence H. Malchman, B.S.,
Ed.M., C.P.A.
Albert Slavin, B.S., M.S., C.P.A.

Assistant Professors

Harley H. Anderson, B.S., M.B.A.
Richard A. Burnham, B.S., M.B.A.,
C.P.A.
Joseph R. Curran, B.S., M.B.A.
Vincent J. Giovinazzo, B.S., M.B.A.
Fawzi A. Salem,
Paul Richards, B.S., M.B.A.

Associate Professors

Anker V. Andersen, B.S., M.B.A.,
Ph.D.
Seth A. Armen, B.S., C.P.A.
William H. Gruber, B.S., M.S.,
Ph.D.
Richard Lindhe, B.S.B.A., B.S.Ed.,
M.Ed., Ph.D.

Instructor

Donald A. duBois, M.B.A.

Accounting

Accounting is the second largest field of professional employment. Accountants may specialize in such areas as auditing, tax work, cost accounting, budgeting and control, systems and procedures, agents, investigations, bank examiners, and management services.

Leaders of institutions — business commerce and industry; state, local and national governments; bureaus and agencies; schools, churches, hospitals and foundations — all rely on data accumulated and prepared by accountants when making decisions which vitally affect the destinies of their institutions. New techniques such as electronic data processing machines are being used for the more effective collection and use of accounting data.

Specimen Program in ACCOUNTING

FIRST YEAR

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
16.106	Earth Science	3	3	16.107	Earth Science	3	3	16.108	Earth Science	3	3
27.101	Found. West.			27.102	Found. West.			27.103	Found. West.		
	Cul.	3	3		Cul.	3	3		Cul.	3	3
30.101	English	3	3	30.102	English	3	3	30.103	English	3	3
41.111	Prin. of Acctg.	4	3	41.112	Prin. of Acctg.	4	3	41.113	Prin. of Acctg.	4	3
19.105	Psych.	4	4	19.106	Psych.	4	4	21.100	Sociology	4	4
	or				or				or		
10.121	Math.	3	3	10.122	Math.	3	3	10.122	Math.	3	3

SECOND YEAR

QUARTER 4				QUARTER 5			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
10.104	Fund. Math.	4	4	10.105	Fund. Math.	4	4
	or				or		
19.105	Found. Psych.	4	4	19.106	Found. Psych.	4	4
39.105	Prin. Econ.	3	3	39.106	Prin. Econ.	3	3
43.120	Mktg. Fund.	3	3	43.121	Mktg. Dynamics	3	3
44.120	Intr. to Finance	3	3	44.121	Intr. to Finance	3	3
45.120	Intr. to Org. & Mgt.	3	3	45.121	Intr. to Pers. & Prod.	3	3

THIRD YEAR

QUARTER 6				QUARTER 7			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
41.251	Inter. Acctg.	4	4	41.252	Inter. Acctg.	4	4
41.253	Cost Acctg.	4	4	41.254	Cost. Acctg.	4	4
44.150	Corp. Fin.	3	3	49.251	Statistics	4	4
49.250	Statistics	4	4		Elective	4	4

FOURTH YEAR

QUARTER 8				QUARTER 9			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
41.255	Adv. Acctg.	4	4	41.256	Adv. Acctg.	4	4
49.258	Acctg. Systems	4	4	41.257	Auditing	4	4
	Elective	4	4	49.155	Legal Asp. Bus.	4	4
	Elective	4	4		Elective	4	4

FIFTH YEAR

QUARTER 10				QUARTER 11			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
41.259	Seminar	4	4	41.260	Taxes	4	4
41.261	Role of Acctg. in Dec. Making	4	4		Elective	4	4
49.210	Law of Bus. Organ.	4	4		Elective	4	4
90.251	Place. Tech.	1	1		Elective	4	4
	Elective	4	4*				

*May be dropped by ROTC students.

Finance and Insurance Department

Edward R. Willett, Professor and Chairman, B.S., M.A., Ph.D.

Professor

Anghel N. Rugina, B.S., M.A.,
Ph.D.

Assistant Professors

William A. Lovely, Jr., B.S., M.B.A.
Edward L. Walls, B.S., M.A., D.B.A.

Associate Professors

Saverio Cerullo, B.S., M.B.A.
Roger A. Cossaboom, B.S., M.B.A.
Robert J. Hehre, B.S., M.S., M.B.A.
C.P.A.
Wesley W. Marple, A.B., M.B.A.,
D.B.A.

Instructor

Arthur E. Busi, B.A., M.B.A.

Finance and Insurance

Students interested in careers in the areas of security analysis, estate planning, corporate finance and control, security or insurance brokerage, underwriting, credit, banking, etc., select the finance and insurance area. There is a wide variety of vocational opportunities in business, financial institutions, and government agencies.

Specimen Program in FINANCE AND INSURANCE

FIRST YEAR

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
16.106	Earth Science	3	3	16.107	Earth Science	3	3	16.108	Earth Science	3	3
27.101	Found. West.			27.102	Found. West.			27.103	Found. West.		
	Cul.	3	3		Cul.	3	3		Cul.	3	3
30.101	English	3	3	30.102	English	3	3	30.103	English	3	3
41.111	Prin. of Acctg.	4	3	41.112	Prin. of Acctg.	4	3	41.113	Prin. of Acctg.	4	3
19.105	Psych. I	4	4	19.106	Psych. II	4	4	21.100	Sociology	4	4
	or				or				or		
10.121	Math.	3	3	10.122	Math.	3	3	10.123	Math.	3	3

SECOND YEAR

QUARTER 4				QUARTER 5			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
10.104	Fund. Math.	4	4	10.105	Fund. Math.	4	4
	or				or		
19.105	Found. Psych.	4	4	19.106	Found. Psych.	4	4
39.105	Prin. Econ.	3	3	39.106	Prin. Econ.	3	3
43.120	Mktg. Fund.	3	3	43.121	Mktg. Dynamics	3	3
44.120	Intr. to Finance	3	3	44.121	Intr. to Finance	3	3
45.120	Intr. to Org. & Mgt.	3	3	45.121	Intr. to Pers. & Prod.	3	3

THIRD YEAR

QUARTER 6				QUARTER 7			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
44.150	Corp. Finance	3	3	44.152	Corp. Finance	3	3
49.206	Info. System	3	3	44.250	Life Insurance	4	4
49.250	Statistics	4	4	49.251	Statistics	4	4
	Electives	8	8		Elective	4	4

FOURTH YEAR

QUARTER 8				QUARTER 9			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
44.252	Prop. Ins.	4	4	44.255	Estate Plan.	4	4
44.270	Investments	4	4	44.275	Money & Cap.		
	Elective	4	4		Mkts.	4	4
	Elective	4	4	49.155	Leg. Asp. Bus.	4	4
					Elective	4	4

FIFTH YEAR

QUARTER 10				QUARTER 11			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
44.260	Fin. Forecasting	4	4	44.272	Security Anal.	4	4
44.280	Seminar F. & I.	4	4	44.281	Seminar F. & I.	4	4
	Elective	4	4		Elective	4	4
	Elective	4	4*		Elective	4	4*

*May be dropped by ROTC students.

Industrial Relations

This major is taught by the faculty of the Management Department.

Industrial Relations

Opportunities exist in the field of labor-management relations for those who are qualified. Both unions and management offer positions in personnel, bargaining, wage administration, and public relations. The Government, too, has openings for men and women who are trained in this field.

Specimen Program in INDUSTRIAL RELATIONS

FIRST YEAR

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
16.106	Earth Science	3	3	16.107	Earth Science	3	3	16.108	Earth Science	3	3
27.101	Found. West. Cul.	3	3	27.102	Found. West. Cul.	3	3	27.103	Found. West. Cul.	3	3
30.101	English	3	3	30.102	English	3	3	30.103	English	3	3
41.111	Prin. of Acctg.	4	3	41.112	Prin. of Acctg.	4	3	41.113	Prin. of Acctg.	4	3
19.105	Psych. I or Math. I	4	4	19.106	Psych. II or Math. II	4	4	21.100	Sociology or Math. III	4	4
10.121	Math. I	3	3	10.122	Math. II	3	3	10.123	Math. III	3	3

SECOND YEAR

QUARTER 4				QUARTER 5			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
10.104	Fund. Math. or Found. Psych.	4	4	10.105	Fund. Math. or Found. Psych.	4	4
19.105	Found. Psych.	4	4	19.106	Found. Psych.	4	4
39.105	Prin. Econ.	3	3	39.106	Prin. Econ.	3	3
43.120	Mktg. Fund.	3	3	43.121	Mktg. Dynamics	3	3
44.120	Intr. to Finance	3	3	44.121	Intr. to Finance	3	3
45.120	Intr. to Org. & Mgt.	3	3	45.121	Intr. to Pers. & Prod.	3	3

THIRD YEAR

QUARTER 6				QUARTER 7			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
41.205	Cost Accounting or Corp. Finance	3	3	41.205	Cost Accounting or Corp. Finance	3	3
44.155	Corp. Finance	3	3	44.155	Corp. Finance	3	3
49.206	Info. Systems or Ind. Psychology	3	3	49.206	Info. Systems or Ind. Psychology	3	3
19.240	Ind. Psychology	3	3	19.240	Ind. Psychology	3	3
45.209	Org. Behavior I	3	3	45.210	Org. Behavior II	3	3
49.250	Statistics or Elective	4	4	49.251	Statistics or Elective	4	4

FOURTH YEAR

QUARTER 8				QUARTER 9			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
45.255	Personnel Mgmt.	4	4	45.256	Indus. Rel.	4	4
45.265	Produc. Mgmt.	4	4	45.266	Produc. Mgmt.	4	4
49.155	Legal Asp. Bus.	4	4		Elective	4	4
	Elective	4	4		Elective	4	4*

FIFTH YEAR

QUARTER 10				QUARTER 11			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
45.270	Senior Seminar	4	4	45.276	Seminar Coll. Barg.	4	4
45.275	Labor Law	4	4		Elective	8	8
90.251	Placement Tech.	1	1		Elective	4	4*
	Elective	4	4				
	Elective	4	4*				

*May be dropped by ROTC students.

Management Department

Lyman A. Keith, Professor and Chairman, S.B., M.A., M.B.A.

Professors

Daniel J. McCarthy, B.S., M.B.A.,
D.B.A.
Carlo E. Gubellini, B.S., M.B.A.
Robert W. Mullins, M.B.A.
A. Howard Myers, A.B., M.A., Ph.D.

Assistant Professors

Angelo J. Fiumara, B.A., LL.B.
Richard B. Higgins, A.B., M.B.A.
Frank M. Mastrapasqua, B.S.,
M.B.A.
Robert E. Otlewski, A.B., M.A., Ph.D.
Barry Shore, B.S.E.E., M.B.A., Ph.D.

Associate Professors

Sidney H. Phillips, A.B., M.Sc.,
Ph.D.
Herman Rochwarg, B.S., Ph.D.
John M. Samaras, A.B.
Daniel C. Scioletti, B.B.A., M.Ed.

Instructor

Steven N. Brenner, A.B., B.Eng.,
M.B.A.

Management

This area of concentration appeals to the student who is more interested in preparation for general business administration and operation rather than any of the more specialized areas of concentration. Positions are available to graduates of this program in commercial, manufacturing, and service businesses. Production planning and control, industrial purchasing and sales, cost control, methods analysis, time study, industrial safety, personnel management, self-employment, and many other vocational opportunities are available.

Specimen Program in MANAGEMENT

FIRST YEAR

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
16.106	Earth Science	3	3	16.107	Earth Science	3	3	16.108	Earth Science	3	3
27.101	Found. West. Cul.	3	3	27.102	Found. West. Cul.	3	3	27.103	Found. West. Cul.	3	3
30.101	English	3	3	30.102	English	3	3	30.103	English	3	3
41.111	Prin. of Acctg.	4	3	41.112	Prin. of Acctg.	4	3	41.113	Prin. of Acctg.	4	3
19.105	Psych. I or	4	4	19.106	Psych. II or	4	4	20.100	Sociology or	4	4
10.121	Math. I	3	3	10.122	Math. II	3	3	10.123	Math. III	3	3

SECOND YEAR

QUARTER 4				QUARTER 5			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
10.104	Fund. Math. or	4	4	10.105	Fund. Math. or	4	4
19.105	Found. Psych.	4	4	19.106	Found. Psych.	4	4
39.105	Prin. Econ.	3	3	39.106	Prin. Econ.	3	4
43.120	Mktg. Fund.	3	3	43.121	Mktg. Dynamics	3	3
44.120	Intr. to Finance	3	3	44.121	Intr. to Finance	3	3
45.120	Intr. to Org. & Mgt.	3	3	45.121	Intr. to Pers. & Prod.	3	3

THIRD YEAR

QUARTER 6				QUARTER 7			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
41.205	Cost Acctg. or	3	3	41.205	Cost Acctg. or	3	3
44.155	Corp. Finance	3	3	44.155	Corp. Finance	3	3
49.206	Info. Systems or	3	3	49.206	Info. Systems or	3	3
19.240	Ind. Psychology	3	3	19.240	Ind. Psychology	3	3
45.209	Org. Behavior	3	3	45.113	Org. Behavior	3	3
49.250	Statistics	4	4	49.251	Statistics	4	4
	Elective	4	4		Elective	4	4

FOURTH YEAR

QUARTER 8				QUARTER 9			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
45.255	Personnel Mgt.	4	4	45.256	Industrial Rel.	4	4
45.265	Produc. Mgmt.	4	4	45.266	Produc. Mgmt.	4	4
49.155	Legal Asp. Bus.	4	4		Elective	4	4
	Elective	4	4		Elective	4	4

FIFTH YEAR

QUARTER 10				QUARTER 11			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
45.270	Senior Seminar	4	4	45.271	Seminar in		
49.210	Law Bus. Org.	4	4		Mgmt.	4	4
90.251	Placement Tech.	1	1		Electives	8	8
	Elective	4	4		Elective	4	4*
	Elective	4	4*				

*May be dropped by ROTC students.

Marketing Department

Charles H. Dufton, Professor and Chairman, A.B., M.A.

Professor

Robert J. Minichiello, A.B., M.B.A.,
D.B.A.

Associate Professors

Charles J. Collazzo, Jr., B.A., M.C.S.,
M.A., Ph.D.

Philip R. McDonald, B.A., M.B.A.,
D.B.A.

Assistant Professor

Richard J. Morrison, B.A., M.B.A.

Marketing

In addition to being a trained specialist in his own area of increasing opportunity and responsibility, the marketing executive must of necessity take a broad view of all aspects of business management.

With marketing, advertising, and sales success so vital to every company, opportunities for careers in marketing exist in every type of business and industry — large or small — in manufacturing and wholesaling as well as retailing; in both consumer and industrial products; in advertising departments, agencies, and media; in sales, research, marketing management, merchandising, and promotion.

Specimen Program in MARKETING

FIRST YEAR

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
16.106	Earth Science	3	3	16.107	Earth Science	3	3	16.108	Earth Science	3	3
27.101	Found. West. Cul.	3	3	27.102	Found. West. Cul.	3	3	27.103	Found. West. Cul.	3	3
30.101	English	3	3	30.102	English	3	3	30.103	English	3	3
41.111	Prin. of Acctg.	4	3	41.112	Prin. of Acctg.	4	3	41.113	Prin. of Acctg.	4	3
19.105	Psych. I or Math. I	4	4	10.106	Psych. II or Math. II	4	4	21.100	Sociology or Math. III	4	4
10.121		3	3	10.122		3	3	10.123		3	3

SECOND YEAR

QUARTER 4				QUARTER 5			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
10.104	Fund. Math. or	4	4	10.105	Fund. Math. or	4	4
19.105	Found. Psych.	4	4	19.106	Found. Psych.	4	4
39.105	Prin. Econ.	3	3	39.106	Prin. Econ.	3	3
43.120	Mktg. Fund.	3	3	43.121	Mktg. Dynamics	3	3
44.120	Intr. to Finance	3	3	44.121	Intr. to Finance	3	3
45.120	Intr. to Org. & Mgt.	3	3	45.121	Intr. to Pers. & Prod.	3	3

THIRD YEAR

QUARTER 6				QUARTER 7			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
43.230	Mktg. Oper. I	3	3	41.209	Distrib. Cost	3	3
43.234	Mktg. Case Anal.	4	4	43.231	Mktg. Oper. II	3	3
49.250	Statistics Elective	4	4	43.263	Retail Mgt. or Elective	3	3
		4	4	49.206	Info. Systems	4	4
				49.251	Statistics	3	3
						4	4

FOURTH YEAR

QUARTER 8				QUARTER 9			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
43.240	Mktg. Res. I	4	4	43.241	Mktg. Res. II	4	4
43.242	Sales Mgt.	4	4	43.262	Advt. Mgt.	4	4
49.155	Legal Asp. Bus. Elective	4	4		Elective	4	4
		4	4		Elective	4	4

FIFTH YEAR

QUARTER 10				QUARTER 11			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
43.250	Mktg. Mgt. I	4	4	43.251	Mktg. Mgt. II	4	4
43.261	Internat. Mktg. or Elective	4	4	43.260	Indust. Mktg. or Elective	4	4
		4	4			4	4
43.270	Mkt. Pol. Sem.	4	4	43.271	Mktg. Theory Sem.	4	4
90.251	Placement Tech. Elective	1	1		Elective	4	4*
		4	4*				

*May be dropped by ROTC students.



College of Pharmacy

LeRoy C. Keagle, Dean

Russell E. Brillhart, Assistant Dean



Aims

NORTHEASTERN UNIVERSITY recognizes the great need for well-educated pharmacists. The College of Pharmacy is pledged to help meet this need through its program of academic and cooperative work and extracurricular activities, all of which are designed to prepare students effectively to become professional practitioners, to enter graduate schools, and to accept employment in the several branches of the pharmaceutical field.

In order to fulfill these aims special emphasis is placed upon the three pillars of a sound pharmacy education — teaching, research, and service. This goal necessitates closely integrated instruction in all of the pharmacy disciplines and its related areas, such as liberal arts, the humanities, and the basic sciences.

A new physical plant has been developed to facilitate these objectives, and the pharmacy faculty consists of scholars who combine research with teaching as part of their regular commitment to the University.

It is intended that the academic, scientific, and professional environment created by the faculty and facilities will promote an atmosphere of inquiry and a healthy dissatisfaction for mediocrity.

The College will prepare its graduates to assume most effectively the intellectual, legal, civil, and moral responsibilities associated with the profession of pharmacy.

Since the professional standing of pharmacy depends upon those who are associated with it, the College seeks to enroll only those whose aptitudes, character, and attitudes are compatible with the profession and its goals.

Once a student has been accepted, the College endeavors to develop in the individual well-balanced personal qualities to meet these requirements.

The curriculum is designed to meet the needs of modern pharmacy in both theoretical and applied aspects. This will permit the graduate to enter all of the various fields of pharmacy. There is continuous search and experimentation for new and improved methods of teaching and new subject material to be presented.

The Future of Pharmacy

Pharmacy has grown far beyond the popular concept of the profession. To many the term "pharmacist" suggests a white-clad, somewhat mysteriously efficient dispenser of medicine in a neighborhood drugstore. It is true that among the 120,000 pharmacists practicing in America today approximately 100,000 work in retail pharmacies.

However, many pharmacists are employed in other challenging branches of the profession. Hospital and industrial pharmacy are both recently enlarging branches of the profession. Pharmacists may find fruitful employment as representatives of drug firms, in research and in teaching. Many governmental agencies also have need of the professional pharmacist.

***Pharmaceutical journalism should not be overlooked.

Pharmacy is not restricted to men. Women now make up 14 per cent of the enrollment in pharmacy colleges, with the number increasing yearly. They comprise nearly 7 per cent of all practicing pharmacists and 33 per cent of the hospital pharmacists.

Several major trends in our national life assure further expansion of the pharmaceutical profession in the years ahead. Within our growing population, the average life span has increased to 67 years for men and 73 for women. Maintaining high standards of health for this enlarged population demands more well-educated pharmacists.

These same medical and pharmaceutical advances which contribute to a longer life span also expand the areas for research and the opportunity for improving existing drugs.

It is unnecessary to dwell on the tremendous increase in college applicants expected during the next decade. The need for trained men and women in the health professions indicates that colleges of pharmacy can expect to enroll a fair portion of the expanding student population.

Certainly the present enrollment in the nation's 74 accredited colleges of pharmacy is not adequate to meet the needs of the future.

Admission Requirements

It is important that applicants for admission to the College of Pharmacy have studied the college preparatory curriculum. In particular, such students should be able to demonstrate strength in the sciences and in mathematics. The following subjects are required:

Subject	Units
English (4 years)	3
Foreign Language (2 years)	2
Science (Biology and Chemistry)	2
Mathematics	3
Other college preparatory subjects	3
Electives, not more than	<u>2</u>
	15

Transfer with Advanced Standing

Northeastern University College of Pharmacy welcomes transfer students who have successfully completed one or two years of preprofessional study in an accredited institution of college grade. A candidate for advanced standing should:

1. Have had courses which enable him to enter at the beginning of the second or third year and thereafter continue as a regular student.
2. Have earned average grades or better in his previous college work. (No credit is given for the lowest passing mark.)

Transfer students are admitted only in September to the College of Pharmacy.

GRADUATION REQUIREMENTS

Degree: Bachelor of Science in Pharmacy

Quantitative Requirements

Candidates for the Bachelor of Science in Pharmacy degree must complete all of the prescribed work of the curriculum, including two Q.H.'s of Physical Education.

Students who undertake cooperative work assignments must meet the requirements of the Department of Cooperative Education before they become eligible for their degrees.

No student transferring from another college or university is eligible to receive a degree until at least three quarters of academic work immediately preceding graduation has been completed at Northeastern.

Qualitative Requirements

The degree conferred not only represents the formal completion of the subjects in the selected course of study but also indicates professional competence in the field of specialization. Students will be expected to maintain an over-all average of C. Those who are clearly unable to meet the accepted standard of attainment will be required to withdraw from the University.

Graduation with Honor

Candidates who have achieved distinctly superior attainment in their academic work will be graduated with honor. Upon special vote of the faculty, a limited number of this group may be graduated with high honor or with highest honor. Students must have been in attendance at the University for at least six quarters before they become eligible for honors at graduation.

Licensure

Licensure may be obtained after graduation by passing the examination requirements established by the Massachusetts State Board of Pharmacy or those of other states.

Accreditation

The College of Pharmacy is accredited by the American Council of Pharmaceutical Education and is a member of the American Association of Colleges of Pharmacy.

Pharmacy Faculty

Professor and Dean

LeRoy C. Keagle, B.S. in Pharm.,
Ph.D.

Professors

Bernard J. Brent, Director, Graduate
School of Pharmaceutical Sciences;
Chairman, Medicinal Chemistry,
B.S., M.S., Ph.D.

Russell E. Brillhart, A.B., B.S. in
Pharm., M.Sc., D.Sc.

O. James Inashima, B.S. in Pharm.,
M.S., Ph.D.

George M. Krause, B.S. in Pharm.,
M.S.

John F. Reinhard, Chairman,
Pharmacology, B.S., M.S., Ph.D.

John W. Schermerhorn, B.S. in
Pharm., Ph.D.

Pierre F. Smith, Chairman, Pharmacy
And Pharmacy Administration
B.S. in Pharm., Ph.D.

Albert H. Soloway, B.S., Ph.D.

Elliot Spector, B.S. in Pharm., Ph.D.

Assistant Professors

Harry C. Clemson, B.S., M.S., Ph.D.

Arnold S. Goldstein, B.S. in Pharm.,
LL.B., M.S.B.A.

Frederick J. Pruyn, B.S., M.S., Ph.D.

Instructors

Alfred W. Eicholzer, B.S., M.S.

Joseph L. Labrecque, B.S. in Pharm.,
M.B.A.

Walter G. Osiecki, B.S. in Pharm.,
M.S.

Lecturer

John W. Webb, B.S., M.S. in Pharm.

Specimen Program in
PHARMACY

FIRST YEAR

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
10.101	Basic Math.	3	3	10.102	Basic Math.	3	3	10.103	Basic Math.	3	3
	or				or				or		
10.111	Calculus	3	3	10.122	Calculus	3	3	10.113	Calculus	3	3
12.121	Gen. Chem.	3(3)	4	12.122	Gen. Chem.	3(3)	4	12.123	Gen. Chem.	3(3)	4
18.111	Gen. Biol.	2(3)	3	18.112	Gen. Biol.	2(3)	3	18.113	Gen. Biol.	2(3)	3
30.101	English	3	3	30.102	English	3	3	30.103	English	3	3
	Mod. Lang.	3	3		Mod. Lang.	3	3		Mod. Lang.	3	3
	or				or				or		
23.101	West. Civ.	3	3	23.102	West. Civ.	3	3	23.103	West. Civ.	3	3
71.201	Pharm. Orient.	1	0	71.202	Pharm. Orient.	1	0				

SECOND YEAR

QUARTER 3A*				QUARTER 4				QUARTER 5			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
22.114	Polit. Issues	5	2½	11.130	Physics	4	4	11.132	Physics	3(3)	4
24.142	Ethics	5	2½	12.141	Org. Chem.	3(3)	4	12.142	Org. Chem.	3(3)	4
30.149	Shakespearean Plays	5	2½	29.100	Pub. Speaking	3	3	29.101	Pub. Speaking	3	3
					Mod. Lang.	4	4		Mod. Lang.	4	4
					or				or		
				39.115	Elective	4	4	39.116	Elective	4	4
					Prin. & Prob. of Econ.	4	4		Prin. & Prob. of Econ.	4	4

*Required to be taken in June.

THIRD YEAR

QUARTER 6				QUARTER 7			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
11.131	Physics	3(3)	4	12.174	Anal. Chem.	4(4)	5
12.143	Org. Chem.	3(3)	4	18.148	Anat. (Hum.)	3(3)	4
18.120	Microbiology (Basic)	3(4)	4	41.208	Intr. to Acct.	4	4
71.211	Pharm. Method.	3(3)	4	71.212	Pharm. Prep.	3(3)	4

FOURTH YEAR

QUARTER 8				QUARTER 9			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
18.158	Physiology	3(3)	4	18.159	Physiology	3(3)	4
71.221	Phys. Pharm.	3(3)	4	71.222	Pharm. Tech.	3(3)	4
71.223	Business Law	4	4	72.221	Inorg. Med.	4	4
73.221	Pharmacognosy	4(3)	5	73.241	Biochemistry	4(4)	5

FIFTH YEAR

QUARTER 10				QUARTER 11				QUARTER 12			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
71.234	Pharm. Juris.	3	3	71.232	Prescrip. Pharm.	4(3)	5	71.238	Ret. Pharm.		
72.222	Drug Analysis	4(4)	5	71.237	Drug Marketing	4	4		Mgmt.	4	4
72.231	Org. Medicinals	4	4	72.232	Org. Medicinals	3	3	71.239	Parapharmaceuticals	2	2
73.231	Pharmacology	3(3)	4	73.232	Pharmacology	3(3)	4	71.240	Intro. to Inst. Pharm.	2	2
73.237	Pharmacognosy	3	3	73.238	Public Health	3	3	71.241	Clin. Pharm.	2(3)	3
90.251	Placement Tech.	1	1					72.233	Org. Medicinals	3	3
								73.239	Public Health	3	3
								73.242	Pharmacology	4	4



College of Nursing

Juanita Long, Acting Dean



College of Nursing

FACULTY

Associate Professor and Acting Dean

Juanita Long, B.S., M.S.

Associate Professors

Lydia A. Bosanko, R.N., M.A.

Goldie Crocker, R.N., D.Ed.

Jean L. Cushman, R.N., M.S.

Mary E. Gonyow, R.N., M.A.

Mary A. Space, R.N., M.A.

Assistant Professors

Dolores C. Chuma, R.N., M.S.

Flora M. DeScenza, R.N., M.S.

Jeanne B. Dorie, R.N., M.A.

Janet A. Finnegan, R.N., M.S.

O. Barbara Goodfellow, R.N., M.S.

Marjorie P. Johns, R.N., M.S.

Assistant Professors (continued)

Juanita O. Long, R.N., M.S.

Eunice C. Messler, R.N., M.A.

E. Lorraine Middleton, R.N., M.S.

Helen M. Rogers, R.N., M.S.

Mary C. Scahill, R.N., M.S.

Joyce E. Tingle, R.N., M.S.

Instructors

Carolyn F. Brokvist, R.N., M.S.

Jane E. Graydon, R.N., M.S.

Doris E. Hibbel, R.N., M.S.

Carol F. Hogan, R.N., B.S.

Mary P. A. Kane, R.N., M.S.

Mary E. Wilcox, R.N., M.S.

Purpose and Plan of the College

The College of Nursing offers two distinct educational programs which prepare individuals to practice nursing. One is three years in length and leads to the degree of Associate in Science; the other is five years in length and leads to the degree of Bachelor of Science in Nursing. Both programs accept qualified male and female applicants.

The associate degree curriculum is designed for students who meet the general requirements for admission to college and who are strongly motivated toward giving direct patient care. All instruction is at the college level, but all courses are not identical in content with those given in the first three years of the curriculum leading to the Bachelor of Science in Nursing degree.

The baccalaureate degree curriculum in nursing is designed for students who meet the requirements for admission to the College and who desire to pursue a professionally oriented educational program in nursing. Its purpose is to prepare students to practice professional nursing in a variety of settings. It serves as a foundation for further professional development and graduate study.

At no point can there be direct transfer from one program to the other.

Methods

In common with the other Basic Colleges at Northeastern, the curricula of the College of Nursing are distinctive in that they operate on the Cooperative Plan, while the University has long applied to technical and professional curricula in many fields. Each student has practical experience as a paid employee of one of the cooperating health agencies in addition to college instruction. The cooperative work does not carry academic credit. During their periods of employment, students have an opportunity to increase their nursing skills and to earn a major part of their expenses.

The College of Nursing programs combine general education courses with nursing courses concurrently to provide the learning foundation for the practice of nursing. The nursing major is planned in sequential order and draws on the content from the physical, biological and social sciences and from the humanities. New teaching technologies (programmed learning, television etc.) are used to assist in meaningful presentation of course content.

The Cooperative Plan in Nursing

Cooperative work placements are arranged by the Nursing Coordinator in accordance with written agreements entered into by the University and the following Boston hospitals:

Beth Israel Hospital
 Children's Hospital Medical Center
 Massachusetts General Hospital
 New England Deaconess Hospital
 Peter Bent Brigham Hospital

Each of the hospitals has agreed to accept a quota of "co-ops" from the Associate Degree and Baccalaureate Degree programs and to provide a suitable sequence of work experiences for students in the Northeastern University College of Nursing.

Assignment of students to cooperative work at specific hospitals is a function of the Nursing Coordinator in the Department of Cooperative Education. The cooperative work experience is an integral part of the degree requirements and students are expected to accept placement at any one of the collaborating hospitals. Student preferences as to assignment will be given consideration in conjunction with other factors but final decision as to hospital assignment must rest with the Nursing Coordinator.

Placement at cooperative work at a hospital other than those listed above can be permitted only under special circumstances and then only upon a petition approved by the Nursing Coordinator.

Admission Requirements

Candidates for admission to the College of Nursing must have been graduated from an accredited secondary school and have the recommendation of the school principal or guidance officer. The following subject-matter credits are required as preparation for the nursing curriculum:

Associate Degree Program	
Subjects	Units
English (4 years)	3
Mathematics	2
Sciences	2
Other college preparatory subjects	6
Electives, not more than	2
	<hr/> 15

Baccalaureate Degree Program

Subjects	Units
English (4 years)	3
Mathematics	3
Biology	1
Physics or Chemistry	1
Other college preparatory subjects	7
	<hr/> 15

Other factors considered by the Department of Admissions are the physical fitness of the candidate and the degree of interest and motivation for the field of nursing. Full health clearance is required prior to matriculation.

GRADUATION REQUIREMENTS**Degrees**

The College of Nursing offers two distinct programs: a three year program leading to the degree Associate in Science and a five year program leading to the degree Bachelor of Science in Nursing.

Quantitative Requirements

Candidates for the degree of Associate in Science or Bachelor of Science in Nursing must successfully complete all of the prescribed courses in the applicable curriculum. For the A.S. degree this totals 121 quarter hours including two hours of physical education and for the B.S. in Nursing degree this totals 178 quarter hours including two hours of physical education. They must also carry out effectively the prescribed periods of cooperative work at one or more of the health agencies associated with the University in the program of nursing education.

Qualitative Requirements

The degree conferred not only represents the formal completion of the curriculum, but also indicates competence for beginning service as a staff nurse. An over-all scholarship average of at least C is required for graduation.

Graduation with Honor

Candidates for the bachelor's degree whose academic achievement is extraordinary will be graduated with honor. Upon special vote of the faculty, a limited number of this group may be graduated with high honor or highest honor. Students must have been in attendance at the University for at least six quarters before they become eligible for honors at graduation.

Registration

The program of the College prepares students for the professional examinations established by the Board of Registration in Nursing of the Commonwealth of Massachusetts. Students normally take these examinations for licensure as registered nurses shortly after graduation.

**Specimen Program in
NURSING
Associate Degree**

FIRST YEAR

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl.	L. Q.H.	No.	Course	Cl.	L. Q.H.	No.	Course	Cl.	L. Q.H.
18.107	Intgrtd. Sci.	4	3 5	18.108	Intgrtd. Sci.	4	3 5	18.109	Intgrtd. Sci.	4	3 5
20.100	Soc. Anthropol.	4	4	19.102	Basic Psych.	4	4	21.100	Prin. of Soc.	4	4
30.101	English	3	3	30.102	English	3	3	30.103	English	3	3
80.100	Intro. Nsg.	1	1	80.102	Fd. Nursing	4	4 5	80.103	Fd. Nursing	4	4 5
80.101	Fd. Nursing	4	4 5			15	7 17			14	7 17
		16	7 18								

SECOND YEAR

QUARTER 4				QUARTER 5			
No.	Course	Cl.	L. Q.H.	No.	Course	Cl.	L. Q.H.
29.100	Public Spkg.	3	3	19.201	Psych. Ab.		
81.101	Med-Surg.				Beh.	4	4
	Nsg.	6	15 11	82.101	Mat. Ch.		
		9	15 14		Health	6	18 12
						10	18 16

THIRD YEAR

QUARTER 6				QUARTER 7			
No.	Course	Cl.	L. Q.H.	No.	Course	Cl.	L. Q.H.
23.210	US to 1865	4	4	23.211	US fr. 1865	4	4
30.151	Mod. Nove.	4	4	30.152	Mod. Drama	4	4
81.102	Med-Surg.			83.101	Psych. Nsg.	3	9 6
	Nsg.	3	9 6		Elective	4	4
90.254	Prof. Dev.	1	1			15	9 18
	Elective	4	4				
		16	9 19				

Specimen Program in NURSING Baccalaureate Degree

FIRST YEAR

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl.	L. Q.H.	No.	Course	Cl.	L. Q.H.	No.	Course	Cl.	L. Q.H.
12.121	Gen. Chem.	3	(3) 4	12.122	Gen. Chem.	3	(3) 4	18.129	Biology	2	(3) 3
18.127	Biology	2	(3) 3	18.128	Biology	2	(3) 3	20.100	Soc. Anthro.	4	4
23.101	West. Civ.	3		23.102	West. Civ.	3		23.103	West. Civ.	3	3
30.101	English	3	3	30.102	English	3	3	30.103	English	3	3
80.201	Nursing	2	(3) 3	80.202	Nursing	2	(3) 3	80.203	Nursing	2	(3) 3
			16				16				16

SECOND YEAR

QUARTER 4				QUARTER 5			
No.	Course	Cl.	L. Q.H.	No.	Course	Cl.	L. Q.H.
18.125	Physiology	2	(3) 4	18.120	Microbiol.	3	(4) 4
18.148	Anatomy	3	(3) 4	18.126	Physiology	2	(3) 3
19.105	Found. of Psych. I	4	4	19.106	Found. of Psych. II	4	4
80.204	Nursing	4	(3) 5	80.205	Nursing	4	(3) 5
			16				16

THIRD YEAR

QUARTER 6				QUARTER 7			
No.	Course	Cl.	L. Q.H.	No.	Course	Cl.	L. Q.H.
19.141	Growth & Development	3	4	19.130	Social Psychology	4	4
21.100	Prin. of Sociology	4	4	19.142	Growth & Dev.	4	4
80.206	Nursing	4	(6) 6	81.201	Med-Surg. Nsg.	4	15 9
			14				17

FOURTH YEAR

QUARTER 8				QUARTER 9			
No.	Course	Cl.	L. Q.H.	No.	Course	Cl.	L. Q.H.
26.101	Intro Phil. I	4	4	26.102	Intro Phil. II	4	4
82.201	Mat.-Ch. Health Elective	4	15 9	83.201	Psychiatric Nursing Elective	5	12 9
			4				4
			17				17

FIFTH YEAR

QUARTER 10				QUARTER 11			
No.	Course	Cl.	L. Q.H.	No.	Course	Cl.	L. Q.H.
19.122	Statistics	5	5	80.210	Nurs. Sem. Elective	4	9
84.201	Pub. Health Nursing Elective	6	9 9				4
		4	4				13
			18				



Boston-Bouvé College

Catherine L. Allen, Dean



BOSTON-BOUVÉ COLLEGE

In July 1964, its fiftieth-anniversary year, Bouvé-Boston School merged with Northeastern to become one of the eight basic Colleges of the University. This union marked the culmination of a half century of excellence as a woman's institution, with curricula in physical education and physical therapy, and with emphasis in health, recreation, and camping throughout its history. As a basic College, Boston-Bouvé became coeducational in all departments; and with the initiation of a new Department of Recreation Education, extended opportunities into three major areas of study.

Professional preparation is based in the liberal arts and sciences, with orientation to each profession beginning in the freshman year. There is a concentration on specific essential skills spaced throughout the programs and on professional theory and practice in the last two years. In the senior year, all students synthesize knowledge and skills through supervised experiences in clinical practice in Physical Therapy, student teaching in Physical Education, or field experience in Recreation Education.

Leadership training, camp counseling, outdoor education and skills, conservation, recreation and park administration enrich learning in the Warren Center for Physical and Recreation Education, with professional camping as an integral part of the education of young men and women.

The Warren Center serves as a practical laboratory for the College. Its sports and water areas, tennis courts, natural outdoor setting of woods, fields and streams, winterized cottages and Hayden Lodge provide year-round opportunities for outdoor learning twenty miles from the Boston campus. Courses, conferences, seminars and workshops are conducted at the Center throughout the year and thus serve University and community needs.

Professional libraries in the Boston-Bouvé building and the Physical Therapy complex in Mary Gass Robinson Hall supplement the Northeastern University library and maintain an up-to-date collection for use by all students and faculty in the College.

Northeastern's Cooperative Plan offers students varied opportunities for earning and learning through alternate terms of work-study experience in upper class years.

Admission Requirements

To be eligible for admission, a candidate must have completed a college preparatory course in secondary school. Rank in class and recommendations of the secondary school administration should be high. Each student's college preparation should include:

Subjects	Units
English (4 years)	3
Mathematics (Geometry and Algebra preferred)	3 or more
Physical Sciences (Biology, Chemistry, Physics)	2 or more
Other college preparatory subjects	7
	15

Biology, Chemistry, Physics are strongly recommended for all Physical Therapy and Physical Education applicants.

Modern Language, Social Science, and Biology are important background subjects for Recreation careers.

Additional requirements basic to the admittance of all prospective majors in Physical Education, Recreation Education, and Physical Therapy are: good health, demonstrated ability to work with people, and the physical competence and skills to undertake the prescribed degree program. Full health clearance is required prior to matriculation at the University and yearly examinations thereafter.

GRADUATION REQUIREMENTS

Degrees

Students graduating in Physical Education and Recreation Education earn the degree of Bachelor of Science in Education and students in Physical Therapy are awarded the degree of Bachelor of Science in Physical Therapy. These degrees are awarded to qualified candidates who have completed the curricula as prescribed. Student teaching, field experience and/or clinical practice is an integral part of the curriculum and is required for graduation.

Quantitative Requirements

The **quarter hours** required in each curriculum differ. Specifically:

Physical Education for Men (5-year cooperative plan)	177	quarter hours
Physical Education for Women (4 and 5-year options)	172	" "
Physical Therapy (4-year plan)	168	" "
Recreation Education (4-year plan)	178	" "

(5-year curriculum to be published in 1967-70;
no 4-year option beginning 1968-69)

Students enrolled in **cooperative work** assignments must meet the requirements of the Department of Cooperative Education to be eligible for their degrees.

Senior year course work and required experiences must be completed in full-time residence at Northeastern University, or in an educational setting approved by the college.

Qualitative Requirements

Students admitted as freshmen are enrolled in the lower division of each curriculum. After completion of 60 credits (inclusive of the term of petition) of acceptable scholarship and performance in the prescribed program, a student may petition for upper division standing; and **must** achieve upper division status by the end of Quarter 7 to be eligible to continue.

Thus students have approximately two years in which to achieve acceptable academic and professional quality point averages, verbal fluency, essential skills in a specific curriculum, emotional maturity and realization of potential for the field in which the student anticipates a career.

Transfer students are required to delay petition for upper division standing for one or more academic terms, until competence to perform adequately in the selected professional program has been demonstrated.

The cumulative quality point averages required to enter each class level are explicitly stated in the Student Handbook. After completing requirements for attainment of upper division standing, the student is expected to maintain 2.5 or better in the field of specialization. The cumulative quality point average of 2.5 in professional courses is required to enter student teaching in Physical Education, clinical practice in Physical Therapy, or field experience in Recreation Education. In the Department of Physical Education for Men, there is a specific requirement of C or better in **Methods and Materials in Physical Education 61.263** for admission to student teaching.

Throughout the professional sequence, students must maintain required averages and demonstrate a high level of personal and professional maturity to continue field practice and to be recommended for graduation.

Transfer Students

Transfer students may be accepted in the College at upper class levels. Each transcript is individually assessed for qualification, placement and course design.

Graduation with Honor

Candidates of distinctively superior achievement in academic work will be graduated with honor. Upon special vote of the faculty, a limited number of this group may be graduated with high honor or highest honor. Students must have been in attendance at the University at least six quarters before they may become eligible for honors at graduation.

Department of Physical Education For Men

John W. Fox, Professor and Chairman, A.B., M.A., Ed.D.

FACULTY

Associate Professors

Carl S. Christensen, B.S., M.S.,
Ph.D.
Harold A. Walker, A.B.
Richard C. Zobel, B.S., M.A., Ed.D.

Instructor

William J. Gillespie, B.S., Ed.M.

Assistant Professors

Robert S. Curtin, B.S., Ed.M.
Royal H. Goheen, B.S., Ed.M.,
Ed.D.
Kerkor Kassabian, B.S., Ed.M.
Charles E. Larson, B.S., M.S.

PHYSICAL EDUCATION FOR MEN

The Department of Physical Education for Men is committed to the professional preparation of highly qualified teachers of physical education for all educational levels — elementary, secondary, college and university. Its graduates are qualified as athletic coaches, physical education teachers, directors of athletics, supervisors of physical education, and leaders in YMCA, boys' clubs, and other youth organization work.

Students majoring in this program receive a strong background in education and liberal arts, with particular emphasis on the behavioral and biological sciences. With this foundation, they then move ahead to the specialized courses in physical education such as history and principles, curriculum development and class procedures, measurement and evaluation, kinesiology and exercise physiology. Students are well grounded in the techniques of coaching the various individual, dual, and team sports, and in adapting these activities to the needs of the handicapped. Because of the close and overlapping relationship among physical education, health, and recreation, physical education majors are required to take courses and are afforded laboratory experiences in these areas.

The development and demonstration of skill in performance and teaching are an integral part of the professional program. Leadership responsibilities and participation are required of all students in the intramural or intercollegiate athletic programs. Students are assigned supervised teaching responsibilities in elementary and secondary schools throughout the Greater Boston area. In addition, students increase their experience with children through cooperative work assignments and as counselors in a laboratory camp.

Modest expenditures are required for physical education uniforms. Fees may be assessed in courses requiring highly specialized equipment, supplies, or off-campus facilities.

The professional program in Physical Education is accredited by the National Council for Accreditation of Teacher Education (NCATE).

Specimen Program PHYSICAL EDUCATION — MEN

FIRST YEAR

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
18.127	Basic Biology	2(3)	3	18.128	Basic Biology	2(3)	3	18.129	Basic Biology	2(3)	3
23.101	West. Civ.	3	3	23.102	West. Civ.	3	3	23.103	West. Civ.	3	3
30.101	English	3	3	30.102	English	3	3	30.103	English	3	3
50.101	Soc. Sci.	3	3	50.102	Soc. Sci.	3	3	50.103	Soc. Sci.	3	3
61.200	Aquatics	1(3)	2	61.205	Gymnastics	1(2)	2	61.113	Sr. Life Sav., or	(3)	1
62.200	P.E. Orient.	1	1	61.210	Elem. Sch. Act.	(3)	1	61.201	Aquatics I	1(3)	2
								61.285	First Aid	1(2)	2

SECOND YEAR

QUARTER 4				QUARTER 5			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
11.136	Physics	3(3)	4	11.137	Physics	3(3)	4
	or				or		
12.135	Chemistry	3(3)	4	12.136	Chemistry	3(3)	4
19.102	Basic Psych.	4	4	30.171	Eng. Lit.	4	4
30.170	Eng. Lit.	4	4		or		
	or			30.181	Amer. Lit.	4	4
30.180	Amer. Lit.	4	4	50.121	H.D. & Learn. I	4	4
61.240	Int. Comb.	(3)	1	61.221	V.B. & Badm.	(3)	1
61.250	Anat. & Physiol.	3(2)	4	61.251	Anat. & Physiol.	3(2)	4

THIRD YEAR

QUARTER 6				QUARTER 7			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
50.131	H.D. & Learn. II	4	4	29.100	Public Speaking	3	3
61.235	Team Sports I	1(2)	2	61.230	S.S. Dance	(3)	1
61.252	Anat. & Physiol.	3(2)	4		Elect. (Coach.)	2(2)	3
62.210	Prin. of P.E.	4	4		Elect. (Comb.)	1(2)	2
65.210	Pers. Health	3	3		Electives	6	6

FOURTH YEAR

QUARTER 8				QUARTER 9			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
61.236	Team Sports II	1(2)		61.220	Surv. Rec.		
61.245	Winter Sports	1(4)	3		Sports	(3)	1
61.263	M.&M. of P.E.	4	4	61.237	Team Sports III	(3)	1
62.253	Kinesiology	4	4	61.280	Camp		
62.260	Meas. & Eval.	4	4		Leadership	1(3)	2
				61.287	Ath. Training	2(2)	3
				63.215	Trends, Issues		
					Rec.	3	3
				65.215	Sch. & Comm.		
					Hlth.	3	3

FIFTH YEAR

QUARTER 10				QUARTER 11			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
23.210	U.S. to 1865	4	4	23.211	U.S. after 1865	4	4
61.212	Hand. & Squash	(3)	1	50.151	Bkgrd. of Am. Ed.	4	4
62.245	Physiol. of Exer.	3(2)	4	62.270	Admin. of P.E.	4	4
62.255	Adapted P.E.	3(2)	4		Elective (P.E.)	1(3)	2
	Elective	4	4		Elective	3	3

*During an out of class quarter students are required to complete 61.290 student teaching, 12 QH.

Department of Physical Education For Women

Kathryn Luttgens, Professor and Chairman, B.S., M.S., Ph.D.

FACULTY

Associate Professors

Jeanne Rowlands, B.A., B.S., M.A.
Mary Nicholson, B.S., M.S.

Instructors

Marilyn Cairns, B.S., M.S.
Martha Knight, B.S., M.Ed.
Jocelyn Leathem, B.S.
Judith Roberts, B.A., M.Ed.
Louise Shaw, B.S.

PHYSICAL EDUCATION FOR WOMEN

Program

The Department of Physical Education for Women conducts three programs in physical education: the undergraduate professional program for students majoring in physical education, the general university instructional program required for all undergraduate women not majoring in physical education or in recreation education, and the Women's Athletic and Recreation Association program open to all undergraduate women students. These programs are conducted to provide opportunities to accomplish specific objectives:

1. The development of desirable attitudes toward physical activity, health, play, and recreation.
2. The development of neuromuscular skills which contribute to the student's over-all health and recreation needs and enjoyment.
3. The development of organic efficiency.
4. The acquisition of knowledges and appreciations relative to the various aspects of physical education.
5. The assessment of the student's own strengths and weaknesses so that she is guided in the selection of activities to meet her needs.

Professional Program

The professional program in physical education is designed to prepare specialists capable of developing the materials and methods appropriate to teaching physical education in public and private schools at all levels — elementary, secondary, and college. Students who pursue this program which combines courses in liberal arts with courses in education and physical education are prepared simultaneously to assume positions of leadership in organizations or agencies that conduct educationally oriented programs of physical activity. Selected program experiences also prepare the student in skills and knowledges requisite to assuming leadership in summer camps.

Students may satisfy the necessary degree requirements through the four-year modified cooperative plan or the optional five-year cooperative program. In each, the academic foundation is the same but the five-year program provides for additional cooperative work periods.

Unique course experiences in this program include the resident Camp Leadership and Counselor Education courses, the resident Winter Sports Week and the twelve-week session in Supervised Teaching. The requirement in Winter Sports is fulfilled at North Conway, New Hampshire during the winter term of the junior year by all students on campus at that time and by all others during the winter term of the senior year. The first course in Camp Leadership and Counselor Education is taken by all students during the three weeks immediately following the spring quarter of the freshman year. The second three-week course requirement follows the spring term in either the middler or the junior year. To meet the twelve-week supervised teaching requirement, students are assigned to selected elementary and secondary schools under the supervision of master teachers.

In addition to course work, leadership responsibilities are essential in professional preparation. Those required include annual participation in the intramural-extramural program; and cooperative work assignments which include at least one summer in a leadership position in a camp or in selected community programs.

The professional program in physical education is accredited by the National Council for Accreditation of Teacher Education (NCATE).

General University Instructional Program

The general university instructional program provides courses to meet the basic physical education requirement of the University consisting of two one-credit courses in physical education. A basic skills and fitness test required of all freshmen women helps guide the student in the selection of her course work. Students whose scores on this test indicate low motor fitness and skills must take the Basic Foundations course as one of the two courses required.

Athletic and Recreation Association Program

The Women's Athletic and Recreation Association has as its prime objective the promotion of activity opportunities of an athletic and recreational nature for all undergraduate women. Throughout the year, participation is possible in badminton, basketball, coeducational volleyball, fencing, field hockey, gymnastics, lacrosse, modern dance, tennis, swimming, and volleyball. Other activities may be offered if student interest warrants, and if facilities are available.

Specimen Program — Four-Year Plan

PHYSICAL EDUCATION — WOMEN

FIRST YEAR

QUARTER 1			QUARTER 2		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
18.127	Basic Biology	2(3) 3	18.128	Basic Biology	2(3) 3
30.101	English	3 3	30.102	English	3 3
50.101	Soc. Sci.	3 3	50.102	Soc. Sci.	3 3
60.121	P.E. Skills	1(3) 2	60.122	P.E. Skills	2(4) 3
62.200	P.E. Orient.	1 1	60.150	Human Anat.	2(3) 3
65.120	Health Ed.	3 3			
QUARTER 3*			QUARTER 3A		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
18.129	Basic Biology	2(3) 3	60.125	Camp Leadership and Outdoor Education I	4
30.103	English	3 3			
50.103	Soc. Sci.	3 3			
60.123	P.E. Skills	2(4) 3			
60.151	Human Anat.	2(3) 3			

SECOND YEAR

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
11.136	Physics	4 4	11.137	Physics	4 4
	or			or	
12.135	Chemistry	4 4	12.136	Chemistry	4 4
19.102	Basic Psych.	4 4	30.171	Eng. Lit.	4 4
30.170	Eng. Lit.	4 4		or	
	or		30.181	Amer. Lit.	4 4
30.180	Amer. Lit.	4 4	50.121	Human Dev.	4 4
60.131	P.E. Skills	2(4) 3	60.132	P.E. Skills	2(4) 3

THIRD YEAR

QUARTER 6			QUARTER 7A		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
18.125	Human Physiol.	2(3) 3	60.141	Anal. of P.E.	2(4) 3
50.131	Human Dev.	4 4	60.143	Winter Sports	1
60.140	Analysis P.E.	2(4) 3	60.220	P.E. Elem. Sch.	4 4
60.160	Instr. Aids	2 2	62.260	Meas. & Eval.	4 4
62.210	Hist., Prin. P.E.	4 4	65.216	M.&M. Health Ed.	4 4
QUARTER 8A			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
18.126	Human Physiol.	2(3) 3		Camp Leadership and Outdoor Ed. II	4
60.142	Analysis P.E.	2(4) 3			
62.253	Kinesiology	4 4			
63.215	Trends, Iss. Rec.	3 3			
	or				
63.135	Social Rec.	2 2			
	Elective	4 4			

FOURTH YEAR

QUARTER 9A			QUARTER 10A			QUARTER 11A		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.
60.280	Supervised Teaching	12	60.230	Adv. Tch. & Anal.	2(4) 3	50.151	Bkgrnd. Am. Ed.	4
				or		60.230	Adv. Tch. & Anal.	2(4)
				Elective	4 4		or	
			62.254	Physiol. of Exer.	3(2) 4	60.261	Curric. Bldg. & Trnd.	4
			62.270	Admin. P.E.	4 4			
			62.255	Adapted P.E.	3(2) 4	65.218	Pub. Health	3
						65.218		

*Additional Requirement: Basic Programmed Mathematics Course to be started during freshmen year a completed prior to quarter 6.

Department of Recreation Education

Albert H. McCay, Associate Professor and Chairman, B.A., M.A., Ed.D.

FACULTY

**Associate Professor and Director
of the Warren Center**

Howard Jeffrey, A.B., M.A., D.R.

Assistant Professor

Frank Robinson, B.A., M.S.

Instructors

Roscoe Bemis, B.S.

Maureen Glancy, B.S.

Lecturers

Lydia Casavant, B.A., M.S.

Mary Alice Queiros, B.S.

RECREATION EDUCATION

Recreation is a vital profession for a rapidly changing world. Prospects for the future clearly point toward increasing leisure time and more available income. Public recognition of the need for trained administrators, teachers, and trained leaders in recreation programs for people of all ages during all seasons of the year has created new demands for career personnel.

Government agencies and educational institutions are expanding their programs. Recreation opportunities exist in community organizations, schools and youth-serving agencies, churches, settlement houses, and hospitals; in business and industry; in the Red Cross, Peace Corps and the Armed Forces; in camps, resorts and parks; in departments of recreation in schools and colleges; in new recreation centers developed by youth groups; and in state, regional and national parks.

The five-year cooperative program of study is based in the liberal arts and sciences, with courses in professional education beginning in the freshman year.

The acquisition of knowledge and skills in arts and crafts, camping, dramatics, music, sports, dance, aquatics, hobbies and adapted recreation for special groups is combined with training in leadership, organization and administration.

Outdoor education, camp counseling, school camping, recreation and park programming are essential aspects of curriculum and the Warren Center of Northeastern University offers an excellent and unique teaching-learning laboratory within easy commuting distance of Boston.

Supervised field experiences both indoors and outdoors provide exciting, and at the same time practical, opportunities with children, youth and adults. In addition, the cooperative plan provides six quarters of practical experience on-the-job in youth agencies, municipal recreation departments, hospitals and institutions, homes for the aging and other selected settings.

Undergraduates in the Department of Recreation Education may elect any one of three emphases: Community Recreation-Education, Adapted Recreation for work with the retarded, the handicapped or the aging, or Outdoor Recreation-Education and Conservation.

The professional program in recreation education is accredited by the National Council for Accreditation of Teacher Education (NCATE).

Specimen Program in RECREATION EDUCATION

FIRST YEAR

QUARTER 1		
No.	Course	Cl. Q.H.
18.127	Basic Biology	2(3) 3
30.101	English	3 3
50.101	Soc. Sci.	3 3
63.120	Orient. Rec.	1 1
63.121	Rec. Skills I	(6) 2
63.150	Anatomy	3 3

QUARTER 2		
No.	Course	Cl. Q.H.
18.128	Basic Biology	2(3) 3
30.102	English	3 3
50.102	Soc. Sci.	3 3
63.122	Rec. Skills II	1(6) 3
63.151	Anatomy	3 3

QUARTER 3*		
No.	Course	Cl. Q.H.
18.129	Basic Biology	2(3) 3
30.103	English	3 3
50.103	Soc. Sci.	3 3
63.123	Rec. Skills III	1(6) 3
65.129	Health Educ.	3 3

QUARTER 3A		
No.	Course	Cl. Q.H.
63.125	Outdoor Educ. & Camp Leadership	4

SECOND YEAR

QUARTER 4		
No.	Course	Cl. Q.H.
16.111	Earth Science I	4 4
19.102	Basic Psych.	4 4
30.180	American Lit.	4 4
63.126	Outdoor Educ.	(3) 1
63.131	Rec. Leadership	1(6) 3
63.133	Rec. Skills IV	(6) 2

QUARTER 5		
No.	Course	Cl. Q.H.
16.112	Earth Science II	4 4
30.181	American Lit.	4 4
50.121	Human Dev.	4 4
63.127	Outdoor Educ.	(3) 1
63.132	Interagency Ping. for Com. Action	3 3
63.134	Rec. Skills V	(6) 2

THIRD YEAR

QUARTER 6A			QUARTER 7A			QUARTER 8A		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
18.125	Hum. Physiol.	2(3) 3	63.143	Winter Sports	1	18.126	Hum. Physiol.	2(3) 3
27.171	Art & Archit.	3 3	63.210	Phil. of Rec. & Leisure	3 3	27.172	Art. & archit.	3 3
29.100	Public Speak.	3 3	63.220	M.&M. in Rec.	3 3	63.129	Outdoor Educ.	(3) 1
29.163	Play Prod. Wrkshp.	4 4	63.250	Group Dynamics	3 3	63.260	Org. & Admin. of Rec. & Parks	4 4
63.128	Outdoor Educ.	(3) 1	63.240	Dance & Cult.	2(3) 3	63.265	Tech. Sup. Evl.	3 3
63.160	Dev. & Util. of Rec. Educ. Res.	3 3	63.255	Adapted Rec. Spec. Groups	3 3	63.270	Arts & Crafts	1(6) 3

FOURTH YEAR

QUARTER 9A			QUARTER 10A			QUARTER 11A		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
63.280	Superv. Field Exp. and Teaching, and Seminar	12	63.290	Senior Seminar and Projects	4 4	21.111	Amer. Society	4 4
			65.218	Public Health	3 3	63.285	Rsch. & Read. in Rec.	4 4
				Selected Elective	4 4		Selected Elective	4 4
				Selected Elective	4 4		Selected Elective	4 4

*Additional Requirement: Basic Programmed Mathematics Course to be completed prior to or concurrent with courses that relate.

This four-year curriculum is only for the year 1968-69. The five-year plan and curriculum, with no four-year option, will be initiated 1969-70.



Department of Physical Therapy

Katharine Carlisle, Professor and Chairman, A.B.

FACULTY

**Professor, Associate Chairman, and
Co-ordinator of Clinical Education**

Kathryn J. Shaffer, B.S., M.S.

Associate Professor

Elizabeth W. Van Slyck, B.S., M.A.

Instructor

Pauline A. Cerasoli, B.S., M.S.

PHYSICAL THERAPY

Physical Therapy is one of the health professions concerned with and contributing to the present-day challenge of comprehensive medical care. This profession is concerned not only with treatment procedures which are directed toward helping the patient regain functional independence, but concerned also with his emotional and socio-economic status and needs in terms of recovery. The physical therapist is highly skilled in evaluation procedures and in the planning and execution of treatment programs appropriate to the condition or disabilities of a patient. The qualified therapist administers physical therapy only upon referral by a physician.

Physical therapy treatment procedures include the use of therapeutic exercise, heat, cold, massage, hydrotherapy and electrotherapy for the specific purpose of restoring the disabled individual to the optimum of his capacity.

The program of study is an integration of liberal arts and sciences and professional courses, with major emphasis on liberal arts in the first half of the program and on professional preparation in the latter half of the program.

The professional courses include such subjects as anatomy, kinesiology, clinical medicine, pathology, physiology, physical therapy procedures, and practical experience in various hospitals and clinics. Professional ethics is stressed throughout the program.

Lecturers from Tufts University School of Medicine and the New England Medical Center Hospitals, as well as from many medical and social agencies in the Boston area, augment the professional staff in the physical therapy program approved by the American Medical Association and by the American Physical Therapy Association. Students completing the program are eligible to take state examinations for registration.

General Objectives

The Department of Physical Therapy is cognizant of the increasing need and demand for modern comprehensive health care and is continuously concerned with the educational preparation of those who will provide physical therapy services of the highest quality.

The over-all objective of the Department is to provide a program which will prepare young men and women for full and useful lives and which will, at the same time, prepare them to achieve in all aspects of the physical therapy profession.

To fulfill this objective, the student is provided with opportunities to:

1. develop breadth and depth of interest and a greater appreciation of the world in which he lives through courses in the liberal arts and sciences.

2. acquire knowledge and understanding of those liberal arts and sciences which are basic to professional courses.
3. develop a specific body of knowledge, understanding, and appreciation of physical therapy.
4. develop skills in physical therapy.
5. set high standards of achievement for himself.
6. develop desirable personal and professional attitudes and relationships.
7. develop an appreciation for continuing personal and professional growth.
8. develop an appreciation of civic interest and responsibility to society in general and to the community of which he is a part.

The Nature of Physical Therapy Clinical Education

Clinical practice is scheduled in the senior year and consists of four different assignments in six-week blocks — two half-day blocks in the fall or winter quarter and two blocks of full-time clinical practice in the spring quarter.

The class is divided into Divisions A and B, with Division A scheduled for clinical practice in the Boston area during the fall quarter and Division B scheduled for clinical practice in the Boston area during the winter quarter. In the first half of the spring quarter, one-half of the senior class is assigned to clinics throughout the New England, New York and New Jersey areas, while the other half is scheduled in the Boston area. This sequence is then reversed in the second half of the quarter.

The total clinical program of each student includes experience in a general hospital, a children's hospital, and a rehabilitation center.

Health Education

FACULTY

Assistant Professor of Health Education

Maura M. Morton, B.A., M.S.

At the present time, this curriculum services all departments in Boston-Bouvé College, and electives may be taken by students in any department or any College.

Specimen Program in PHYSICAL THERAPY

FIRST YEAR

QUARTER 1			
No.	Course	Cl. Q.H.	
10.101	Basic Math.	3	3
12.121	Gen. Chemistry	3(3)	4
18.127	Basic Biology	2(3)	3
30.101	English	3	3
65.129	Health Ed.	3	3

QUARTER 2			
No.	Course	Cl. Q.H.	
10.102	Basic Math.	3	3
12.122	Gen. Chemistry	3(3)	4
18.128	Basic Biology	2(3)	3
30.102	English	3	3
60.101	Physical Ed.	(2)	1
64.111	Intro. Phys. Ther.	1(1)	1

QUARTER 3			
No.	Course	Cl. Q.H.	
10.103	Basic Math.	3	3
12.123	Gen. Chemistry	3(3)	4
18.129	Basic Biology	2(3)	3
30.103	English	3	3
60.102	Physical Ed.	(2)	1
64.112	Intr. Phys. Ther.	1(1)	1

QUARTER 3A			
No.	Course	Cl. Q.H.	
60.125	Summer Camp (Elective)	8	

SECOND YEAR

QUARTER 4			
No.	Course	Cl. Q.H.	
11.136	Physics	3(3)	4
19.102	Basic Psych.	4	4
	Soc. Sci. Elect.	4	4
	or		
	History Elective	4	4
	Human. Elective	4	4
	or		
	Mod. Lang. Elect.	4	4

QUARTER 5			
No.	Course	Cl. Q.H.	
11.137	Physics	3(3)	4
50.121	Human Dev.	4	4
	Soc. Sci. Elect.	4	4
	or		
	History Elective	4	4
	Human. Elective	4	4
	or		
	Mod. Lang. Elect.	4	4

THIRD YEAR

QUARTER 6				QUARTER 7				QUARTER 8			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
18.125	Human Physiol.	2(3)	3	64.131	Applied Anatomy	3(3)	4	18.126	Human Physiol.	2(3)	3
29.100	Speech	3	3	64.143	Phys. Ther. I	2(6)	5	64.154	Phys. Ther. II	1(4)	3
64.121	Gross Anatomy	3(6)	5	64.210	Pathology	3	3	64.155	Phys. Ther. III	2(2)	3
	Elective	4	4	64.220	Clin. Medicine I	3	3	64.221	Clin. Medicine II	2	2
				65.218	Public Health	3	3	64.235	Psychiatry	3	3
									Elective	4	4

FOURTH YEAR

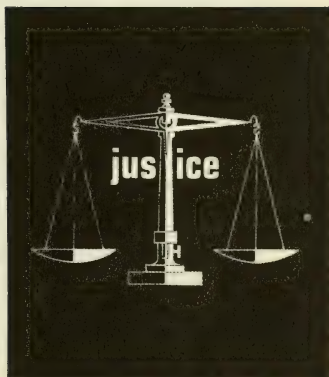
QUARTER 9A				QUARTER 10A				QUARTER 11			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
64.164	Phys. Ther. IV	1(6)	4	64.172	Phys. Ther. VI	2(2)	3	64.195	Spvsd. Clin. Prac.	(40)	8
64.165	Prof. Lit. & Rehab.	2	2	64.175	Ethics & Admin.	2	2				
64.171	Phys. Ther. V	1(2)	2	64.222	Clin. Medicine III	3	3				
64.185	Sup. Clin. Prac.	(17)	5	64.245	Applied Physiol.	2(3)	3				
64.190	Clinical Sem.	1			Elective	4	4				
64.250	Neuroanatomy	3	3								





College of Criminal Justice

Charles W. Tenney, Jr., Dean



FACULTY

Associate Professors

Robert Sheehan, A.B., M.A.

Frederick Cunliffe, B.S., M.S., Ph.D.

General Objective

The College of Criminal Justice, established in 1966 under a grant from the Ford Foundation, prepares young men and women for professional careers in law enforcement. The curriculum has been designed primarily for students interested in municipal and state police service. However, federal investigative agencies and industrial security operations in private industry also offer many challenging and rewarding opportunities. It is expected that a number of graduates will choose to pursue advanced study in academic fields ranging from social work to public administration. The program of study in the College of Criminal Justice is admirably suited to preparation for admission to the Northeastern School of Law, which will be reestablished in 1968 and which will give special emphasis to the education of trial lawyers.

It is evident that this new college is urgently needed to meet a growing social problem of our times. Methods of police administration and law enforcement are changing drastically to cope with contemporary developments. Those engaged in this important service to society now need much more formal education than in the past.

Northeastern's new College of Criminal Justice will make a substantial contribution to the education of professional personnel in law enforcement in the years ahead.

Methods and Purpose

The College of Criminal Justice offers a five-year academic program on the Cooperative Plan of Education which allows a candidate for the baccalaureate degree to undertake a highly specialized program of study. It is anticipated that "co-op" assignments will include work in police departments, juvenile and adult correctional institutions, and probation, parole and social agencies. At present, only the Bachelor of Arts degree with concentration in the field of Law Enforcement is offered. Plans are under way to develop other curricula in Corrections, Delinquency Prevention, and Security.

The student will receive a broad educational background for his future specialized role in law enforcement. Course work in the social sciences and the humanities will be integrated with studies in juridical theory and practice, since the student will be preparing himself for a career involving the social problems of people from all walks of life. The liberal content of the curriculum is not only highly desirable for its value as a foundation upon which his general intellectual development may be based, but also as an indispensable educational requirement for professional service in his field of special interest.

The graduate must be prepared to judge objectively the many socio-economic problems inherent in the administration of justice in contemporary American society. Obsolete and intellectually antiquated methods of admin-

istering justice have no place in a highly developed urban-industrial civilization. The College of Criminal Justice of Northeastern University will help prepare the student for a career which will not only be personally productive and rewarding but intellectually stimulating as well. He will become a pioneer in one of America's most important newly emerging professions.

ADMISSION REQUIREMENTS

All applicants are expected to have completed the following subject-matter units:

Subject	Units
English (4 years)	3
Modern Language (2 years)	2
Mathematics (minimum)	1
Science (minimum)	1
Other college preparatory subjects	4
Electives, not more than	4
TOTAL	<hr/> 15

GRADUATION REQUIREMENTS

Quantitative Requirements

Candidates for the Bachelor of Arts degree must complete all of the prescribed work of the curriculum. This curriculum totals 176 quarter hours credit including two quarter hours of physical education.

Students who undertake cooperative work assignments must meet the requirements of the Department of Cooperative Education before they become eligible for their degrees.

No student transferring from another college or university is eligible to receive a degree until at least one year of academic work immediately preceding graduation has been completed at Northeastern.

Qualitative Requirements

The degree conferred not only represents the formal completion of the subjects in the selected course of study but also indicates professional competence in the field of specialization. Students will be expected to maintain an over-all average of C. Those who are clearly unable to meet the accepted standard of attainment will be required to withdraw from the University.

Graduation with Honor

Candidates who have achieved distinctly superior attainment in their academic work will be graduated with honor. Upon special vote of the faculty, a limited number of this group may be graduated with high honor or with highest honor. Students must have been in attendance at the University for at least three years before they become eligible for honors at graduation.

Specimen Program in CRIMINAL JUSTICE

FIRST YEAR

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
16.101	Earth Science	3	3	16.107	Earth Science	3	3	16.108	Earth Science	3	3
22.101	Intr. Pol. Sci. I	3	3	22.102	Intr. Pol. Sci. II	3	3	22.103	Intr. Pol. Sci. III	3	3
23.101	Western Civ. I	3	3	23.102	West. Civ. II	3	3	23.103	West. Civ. III	3	3
30.101	English I	3	3	30.102	English II	3	3	30.103	English III	3	3
92.101	Intr. Crim. Just.	4	4	90.102	Intr. Crim. Just.	4	4	92.103	Intr. Crim. Just.	4	4

SECOND YEAR

QUARTER 4				QUARTER 5			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
19.105	Found. Psych. I	4	4	19.106	Found. Psych. II	4	4
22.131	Amer. Nat'l Govt.	4	4	22.141	Govt. & Pol. States	4	4
92.110	Pol. Comm. Rel.	4	4	92.121	Invest. Rep. Writing	4	4
92.111	Police Patrol	4	4	92.122	Interviews & Interr	4	4

THIRD YEAR

QUARTER 6				QUARTER 7			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
21.100	Prin. of Soc.	4	4	21.130	Criminology	4	4
92.131	Law Enf. Adm. & Mgmt.	4	4	92.132	Police Supervision	4	4
92.143	Intr. Criminalistics	4	4	92.134	Civ. Liberties Substantive Due Process	4	4
19.202	Abnormal Psych. I or Elective	4	4	19.203	Abnormal Psych. II or Elective	4	4

FOURTH YEAR

QUARTER 8				QUARTER 9			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
21.150	Race Relations	4	4	21.141	Urban Society	4	4
92.141	Criminal Law: Procedural Due Process	4	4	92.142	Evidence & Court Procedure	4	4
92.133	Crim. Inv. & Case Prep.	4	4	92.144	Police Juvenile Methods	4	4
					Elective	4	4
					Elective	4	4

FIFTH YEAR

QUARTER 10				QUARTER 11			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
22.261	Public Admin.	4	4	92.152	Rec. & Computer Tech. in Law	4	4
92.151	Traffic Law Enf.	4	4		Enf.	4	4
92.153	Police Planning	4	4	92.154	Research Meth. in Law Enf.	4	4
	Elective	4	4	92.155	Seminar in Law	4	4
					Enf.	4	4
					Elective	4	4

Military Science (ROTC)

Professor

Frederic H. Palmblad, A.B., Chairman

Associate Professors

Richard S. Bentley, LTC, USA, A.B.

Dwight O. Henderson, LTC, USA,
B.S.

Richard E. Sochacki, LTC, USA,
B.S.

Bernard R. Theriault, LTC, USA,
B.B.A.

Assistant Professors

Boreslaw P. Berestecky, MAJ, USA,
B.S.

Joseph H. Cordella, MAJ, USA, B.S.

James P. Daniel, MAJ, USA, B.S.

Myron Diduryk, MAJ, USA, B.S.

Lawrence R. Hawkins, MAJ, USA,
B.S.

Harry Z. Kageleiry, MAJ, USA, B.S.

Robert L. Strickland, MAJ, USA,
B.S./BA

Michael Volpe, Maj, USA, B.E.E.,
M.S.C.E.

Henry C. Watson, III, MAJ, USA,
B.S.

Samuel L. Gwin, Jr., CPT, USA,
B.A.

Thomas M. Lyons, CPT, USA, B.S.

James T. Nolan, CPT, USA, B.S.

Robert E. Walsh, CPT, USA, B.A.

Instructors

Robert F. Higgins, SGM, USA

John T. Oliver, 1SG, USA

Armand J. Parenteau, MSG, USA

Stanley E. Madore, SFC, USA

Eddie Spann, SFC, USA

William J. James, SSG, USA

Stanley J. Tomsick, SSG, USA

David Cole, SSG, USA

Francis Belgrade, SSG, USA

Michael A. Egersheim, SP5, USA

Specimen Program in BASIC ROTC

FIRST YEAR

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
91.101	Mil. Sci. I Org. Army & ROTC Indiv. Wpns. & Mksmanship U.S. Army & Nat'l. Sec.	3	1	91.102	Mil. Sci. I American Mil. History Leadership Lab	3		91.103	Mil. Sci. I American Mil. History; Leadership Lab	3	1

SECOND YEAR

QUARTER 4				QUARTER 5			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
91.104	Mil. Sci. II Map & Aerial Photo Reading Intro. to Tactics	3	1	91.105	Small Unit Tactics Leadership Lab	3	1

ADVANCED ROTC

THIRD YEAR

QUARTER 6		
No.	Course	Cl. Q.H.
91.106	Mil. Sci. II Small Unit Tactics Leadership Lab	3 2.5

QUARTER 7		
No.	Course	Cl. Q.H.
91.107	Mil. Sci. III Branches of Army Leadership Lab	(2) 2.5

FOURTH YEAR

QUARTER 8		
No.	Course	Cl. Q.H.
91.108	Mil. Sci. III Mil. Teaching Principles Operations	3 2.5

QUARTER 9		
No.	Course	Cl. Q.H.
91.109	Mil. Sci. IV Operations Counterin- surgency Leadership Lab	1 (2) 2.5

FIFTH YEAR

QUARTER 10		
No.	Course	Cl. Q.H.
91.110	Mil. Sci. IV Leadership and Management World Affairs A Strategic Analysis	3 2.5

QUARTER 11		
No.	Course	Cl. Q.H.
91.111	Mil. Sci. IV Mil. Law Serv. Orient. Map Reading Leadership Lab	2 (1) 2.5

Courses of Instruction

On the pages which follow are given in numerical order the synopses of courses offered in the several curricula of the Basic Colleges. All courses will be offered each year unless otherwise stated. The term "prerequisite" indicates a course that must be taken before undertaking the advanced course to which it applies.

Courses in the part-time evening programs in the College of Engineering are identical with those in the full-time day program.

A "quarter" hour equals approximately three clock hours of work: ordinarily one hour of class and two hours of preparation a week for a quarter of twelve weeks. Laboratory and drawing courses normally require fewer hours of outside preparation and, therefore, carry less credit than lecture courses.

The University reserves the right to withdraw, modify, or add to the courses offered or to change the order of content of courses in any curriculum.

ABBREVIATIONS

Prereq.	Prerequisite
Cl.	Class Hours
Lab.	Laboratory Hours
Q.H.	Quarter Hours

Course Numbering Program

The number to the left of the decimal point indicates the academic department offering the course. The three digits after the decimal point merely differentiate the courses within the department.

Accounting	41.	History	23.
Anthropology	20.	Industrial Engineering	05.
Art	27.	Journalism	38.
Biology	18.	Management	45.
Business General	49.	Marketing	43.
Chemical Engineering	04.	Mathematics	10.
Chemistry	12.	Mechanical Engineering	02.
Civil Engineering	01.	Medicinal Chemistry	72.
Coop and Interdisciplinary	90.	Military Science	91.
Criminal Justice	92.	Music	28.
Drama and Speech	29.	Nursing	80.-84.
Earth Sciences	16.	Pharmacy & Pharm. Adm.	71.
Economics	39.	Pharmacology & Cognosy	73.
Education — Foundation	50.	Philosophy & Religion	26.
Education — Instruction	51.	Phys. Ed. — Men	61.
Education — Reading	54.	Phys. Ed. — Women	60.
Education — Rehabilitation & Special	55.	Phys. Ed. — Men & Women	62.
Electrical Engineering	03.	Physical Therapy	64.
English	30.	Physics	11.
Finance and Insurance	44.	Poly. Sci.	22.
French	31.	Psychology	19.
German	33.	Recreation	63.
Graphic Science	09.	Russian	34.
Health Education	65.	Sociology	21.
		Spanish	32.

Civil Engineering

1.110 Surveying I

(Prereq. 10.143) 3 Cl.; 3 Lab.; 4 Q.H.

Basic surveying principles with field applications; theory of measurements and survey calculations for traverses; stadia, topography, horizontal and vertical curves, earthwork calculations, with electronic computer applications.

Prof. Domey

Fall and Summer Qtrs.

1.111 Surveying II

(Prereq. 1.110) 4 Cl.; 3 Lab.; 5 Q.H.

Spiral easement curves; electronic measurement; basic photogrammetry and theory and practice of astronomical surveying. Laboratory portion consists of complex problem solutions with emphasis on electronic computer applications.

Prof. Domey

Fall and Winter Qtrs.

1.113 Computer Applications in Surveying

(Prereq. Basic Surveying) 2 Cl.; 2 Q.H.

Primarily for transfer students who have had a recognized course in surveying but no work with programming for high-speed electronic digital computers. Programming techniques and their applications to the solution of surveying problems.

Prof. Lenney

Spring Qtr.

1.120 Fluid Mechanics I

(Prereq. 1.140) 4 Cl.; 4 Q.H.

Fluid properties; fluid statics; buoyancy; stability of dams, continuity; Euler and Bernoulli equations; momentum; general energy equation; viscosity; dimensional analysis; dynamic similarity; lift and drag; model testing; flow measurements; fluid machinery.

Prof. Goodman

Spring and Summer Qtrs.

1.121 Fluid Mechanics II

(Prereq. 1.120) 3 Cl.; 3 Q.H.

Flow of incompressible fluids in pipes; analyses of pipe networks and systems involving reservoirs, pipes, pumps, and turbines; open channel flow including uniform flow and elementary problems involving local phenomena and varied flow. Compressible flow in pipes.

Prof. Goodman

Fall and Winter Qtrs.

1.126 Fluid Mechanics

(Prereq. 2.101) 3 Cl.; 3 Q.H.

Fluid properties; fluid statics; continuity; Euler and Bernoulli equations; momentum; general energy equation; dimensional analysis; pipe friction; lift and drag; introduction to potential flow theory.

Prof. Goodman

Fall, Winter and Spring Qtrs.

1.130 Highway and Construction Engineering

(Prereq. 1.111) 4 Cl.; 4 Q.H.

The engineering considerations in the planning and construction of modern highway systems. Administration agencies, traffic studies, and highway financing; flexible and rigid pavement design; an introduction to the Critical Path Method for scheduling and analyzing construction costs.

Prof. Domey

Spring Qtr.

1.132 Highway & Construction Engineering

(Prereq. 1.111) 2 Cl.; 2 Q.H.

For Part-Time Civil Engineering Program. The engineering considerations in the planning and construction of modern highway systems; administration agencies, traffic studies, and highway financing.

Prof. Domey

Fall Qtr.

1.133 Highway and Construction Engineering

(Prereq. 1.132) 2 Cl.; 2 Q.H.

For Part-Time Civil Engineering Program. Flexible and rigid pavement design; introduction to the Critical Path Method for scheduling and analyzing construction costs.

Prof. Domey

Winter Qtr.

1.140 Structural Mechanics 1

(Prereq. 11.102) 4 Cl.; 4 Q.H.

Fundamental concepts; force systems; resultant forces; equilibrium forces; friction; centroids; first and second moments of areas.

Prof. Namyet

Winter and Spring Qtrs.

- 1.141 Structural Mechanics II** (Prereq. 1.140) 4 Cl.; 4 Q.H.
 Stress and strain, mechanical properties of materials. Theories of failure, axially loaded members, buckling and torsion.
 Prof. Namyet Fall and Winter Qtrs.
- 1.142 Structural Mechanics III** (Prereq. 1.141) 4 Cl.; 4 Q.H.
 Shear and bending moment diagrams; flexural and shear stresses in beams, straight, curved, symmetrical and unsymmetrical; analysis of two-dimensional and three-dimensional trusses; influence lines for determinate structures and three-dimensional trusses; influence lines for determinate structures.
 Prof. Namyet Fall and Winter Qtrs.
- 1.143 Structural Analysis I** (Prereq. 1.142) 4 Cl.; 4 Q.H.
 Methods of computing deflections of trusses, beams, and frames by virtual work, moment-area, Williot-Mohr, Bar Chain, Castigliano's method and Maxwell's Law. Effects of load, temperature, fabrication errors and support motion are considered.
 Prof. Namyet Spring and Summer Qtrs.
- 1.144 Structural Analysis II** (Prereq. 1.143) 3 Cl.; 3 Q.H.
 Methods of stress analysis of statically indeterminate structures including superposition, slope deflection, moment distribution and least work.
 Prof. Spencer Fall and Winter Qtrs.
- 1.145 Structural Analysis III** (Prereq. 1.144) 3 Cl.; 3 Qtrs.
 Matrix methods of structural analysis for the treatment of beams, frames, grids and trusses.
 Prof. Leet Spring Qtr.
- 1.146 Structural Mechanics IA** (Prereq. 1.140) 2 Cl., 2 Q.H.
 For Part-Time Civil Engineering Program. Fundamental concepts; force systems, resultant forces; equilibrium forces.
 Prof. Amory Fall Qtr.
- 1.147 Structural Mechanics IB** (Prereq. 1.146) 2 Cl.; 2 Q.H.
 For Part-Time Civil Engineering Program. Centroids; first and second moments of areas.
 Prof. Amory Winter Qtr.
- 1.148 Structures** (Prereq. 2.103) 3 Cl.; 3 Q.H.
 The analysis and design of simple structures with emphasis on structures of special interest to Mechanical Engineers; correlation of the assumptions made in Structural Design with the principles of strength of materials.
 Prof. Cahoon Fall and Winter Qtrs.
- 1.150 Concrete Design I** (Prereq. 1.141) 4 Cl.; 4 Q.H.
 Use of reinforced concrete as structural material; analysis of behavior of reinforced concrete members and modes of failure; deduction of theory of design based on ultimate strength and on theory of elasticity; design flexural members, bond, anchorage, cut-off lengths, continuous members; evaluation of design versus field conditions and resulting conclusions with respect to safety.
 Prof. Firnkas Spring and Summer Qtrs.

1.151 Concrete Design II

(Prereq. 1.150) 3 Cl.; 3 Q.H.

Diagonal tension; design of vertical and inclined shear reinforcing; analysis and design of columns; effects of shrinkage and creep on structures; special structural systems; design of prestressed concrete standard sections; connection and erection details.

Prof. Firnkas

Fall and Winter Qtrs.

1.160 Structural Design I

(Prereq. 1.141) 4 Cl.; 4 Q.H.

The design of individual members in structural frameworks using latest specifications; the end connections for the members designed.

Prof. Cahoon

Fall and Winter Qtrs.

1.161 Structural Design II

(Prereq. 1.160) 3 Cl.; 3 Lab.; 4 Q.H.

The design of built-up members; composite design; plastic design; simple design projects to be completed by the student.

Prof. Cahoon

Spring Qtr.

1.172 Soil Mechanics

(Prereq. 1.170) 4 Cl.; 4 Q.H.

Types and methods of soil classification; soil-water phase relationships; basic introduction to soil stabilization, seepage and ground water flow, stress distributions, consolidation theory, and shear strength of soils. Demonstrations of the basic laboratory tests.

Prof. Jaworski

All Qtrs.

1.180 Materials

(Prereq. 12.113) 4 Cl.; 4 Q.H.

The structure, properties, production and usage of construction materials, including inorganic materials such as cement and concrete, ferrous and nonferrous metals and alloys, glass, stone and brick, and organic materials including wood and plastics; insulating materials and protective coatings.

Prof. Amory

Spring and Summer Qtrs.

1.182 Experimental Methods in Engineering Mechanics

(Prereq. 1.141) 1 Cl.; 4 Lab.; 4 Q.H.

Survey of experimental techniques and instrumentation; experimental determination of basic material properties for concrete, wood, metals, and other engineering materials, and introduction to model analysis.

Prof. Leet

All Quarters

1.190 Sanitary Engineering I

(Prereq. 1.121) 4 Cl.; 4 Q.H.

Introduction to city planning, including methods of predicting population and economic growth; urban renewal, transportation, zoning, and financial planning; unit operations of water and sewage treatment; flow sheets and hydraulic layout of water and sewage treatment; elements of stream sanitation.

Prof. Meserve

Fall and Winter Qtrs.

1.191 Sanitary Engineering II

(Prereq. 1.190) 4 Cl.; 4 Q.H.

Problems in applied hydrology; design of water supply facilities, water distribution systems, and sanitary and storm sewer systems; refuse disposal, air pollution, and other topics in environmental health engineering.

Prof. Meserve

Spring Qtr.

- 1.192 Sanitary Engineering III** (Prereq. 1.190) 3 Cl.; 3 Lab.; 4 Q.H.
 Process design of water and water waste treatment; plants; biology and chemistry of water and waste water; plant design, including instrumentation and mechanical and electrical features; laboratory work and reports covering analysis of water and wastes, and process applications.
 Prof. Meserve Spring Qtr.

Mechanical Engineering

- 2.101 Mechanics I** 4 Cl.; 4 Q.H.
 Forces, moments and couples; resultants and equilibrium of force systems; internal forces; statically indeterminate problems; stress, strain; relationships between stress and strain; mechanical properties of materials.
 Prof. Mills Fall and Winter Qtrs.
- 2.102 Mechanics II** 4 Cl.; 4 Q.H.
 Centroids and centers of gravity; moments of inertia of area; shear and moment equations and diagrams; singularity functions; torsion of circular shafts; combined axial and torsional loading; symmetrical and unsymmetrical bending; combined stresses in bending; beam deflections.
 Prof. Mills Spring and Summer Qtrs.
- 2.103 Mechanics III** 4 Cl.; 4 Q.H.
 Kinematics of particles, plane motion; kinematics of rigid body plane motion, including rotating reference frames using analytical and graphical techniques; friction; force, mass, acceleration analysis of rigid body plane motion; mass moments of inertia.
 Prof. Long Fall and Winter Qtrs.
- 2.104 Mechanics IV** 4 Cl.; 4 Q.H.
 Space motion, particles and rigid bodies; work and energy; impulse and momentum; Euler's equations; stability phenomena, including column buckling.
 Prof. Long Spring and Summer Qtrs.
- 2.105 Fluid Mechanics I** (Prereq. 2.104) 3 Cl.; 3 Q.H.
 Fundamental concepts, description of forces and motion in a fluid; conservation of mass, momentum, and energy as applied to systems and control volumes; dimensional analysis.
 Prof. Nelson Fall and Winter Qtrs.
- 2.106 Fluid Mechanics II** (Prereq. 2.105) 4 Cl.; 4 Q.H.
 Two-dimensional potential flow; viscous effects; laminar and turbulent flow; boundary layer theory; pipe flow; elements of one-dimensional isentropic compressible flow; shock waves.
 Prof. Nelson Spring and Summer Qtrs.
- 2.107 Vibration and Control** (Prereq. 2.104) 4 Cl.; 4 Q.H.
 Analysis of single and multiple degree of freedom vibrating systems; simple feedback control problems.
 Profs. Blanchard and Dunn Fall and Winter Qtrs.

- 2.108 Design Fundamentals** (Prereq. 2.104) 4 Cl.; 4 Q.H.
Advanced Strength of Materials with emphasis on design applications, including stress analysis, deflection analysis, theories of failure and selection of materials, stress concentrations, creep and plasticity, fluctuating loads for ductile and brittle materials; principles of design.
Prof. Mills Fall and Winter Qtrs.
- 2.109 Machine Design** (Prereq. 2.108) 4 Cl.; 4 Q.H.
Application of design fundamentals to mechanical elements and complete machines. Optimum and creative design are included in a project study.
Prof. Sexton Spring Qtr.
- 2.115 Mechanics A** 4 Cl.; 4 Q.H.
Resultants and equilibrium of force systems; centroids; moments of areas; internal forces; point stress; strains; statically indeterminate problems; torsion.
Prof. Phalen Fall and Winter Qtrs.
- 2.116 Mechanics B** (Prereq. Civil Eng. Statics) 4 Cl.; 4 Q.H.
Introduction to kinematics and kinetics of particles and rigid bodies; work and energy; inertia of masses.
Prof. Phalen Spring and Summer Qtrs.
- 2.117 Mechanics C** (Prereq. 2.101) 3 Cl.; 3 Q.H.
Introduction to kinematics and dynamics of particles and rigid bodies; inertia of masses.
Prof. Dunn Fall and Winter Qtrs.
- 2.118 Mechanics D** (Prereq. 2.115) 4 Cl.; 4 Q.H.
Bending stresses and strains; inertia of masses, kinematics and dynamics of particles and rigid bodies; work and energy.
Prof. Phalen Spring and Summer Qtrs.
- 2.119 Mechanics E** (Prereq. 2.115) 4 Cl.; 4 Q.H.
Bending stresses and strains; kinematics of particles including rotating reference frames using analytical and graphical techniques.
Prof. Mills Spring and Summer Qtrs.
- 2.120 Thermodynamics** (Prereq. 10.145, 11.105) 3 Cl. 3 Q.H.
Fundamental concepts of thermodynamics; properties of pure substances, work and heat; the first law of thermodynamics; the second law and entropy; ideal gases; mixtures of ideal gases.
Prof. Mark All Quarters
- 2.121 Thermodynamics I** (Prereq. 10.145 11.105) 4 Cl.; 4 Q.H.
Fundamental concepts of thermodynamics; properties of pure substances, work, and heat; the first law of thermodynamics; the second law and entropy; ideal gases; mixtures of ideal gases; availability, irreversibility and efficiency.
Prof. Mark Fall and Winter Qtrs.

- 2.122 Thermodynamics II** (Prereq. 2.121) 4 Cl.; 4 Q.H.
Detailed study of thermodynamic principles and their application in engineering; power plant cycles; refrigeration cycles; reciprocating machinery; air standard otto and diesel cycles; flow through nozzles and blade passage.
Prof. Foster Spring and Summer Qtrs.
- 2.123 Thermodynamics III** (Prereq. 2.122) 4 Cl.; 4 Q.H.
Discussion of thermodynamic relations, equations of state and deviation equations for ideal gases are discussed followed by consideration of combustion phenomena and its application to heat engines. Detailed development of thermochemistry, chemical equilibrium and chemical potential and application of the resulting equations to combustion engines.
Prof. Zelinski Fall and Winter Qtrs.
- 2.124 Heat Transfer** (Prereq. 2.123) 4 Cl.; 4 Q.H.
Modes of heat transfer; steady state conduction, one and two dimensions; transient conduction; mathematical and graphical techniques; electrical analogy; forced convection; natural convection; radiation; condensation and boiling heat transfer; heat exchangers.
Prof. Mark Spring and Summer Qtrs.
- 2.125 Nuclear Engineering** (Prereq. 11.104, 2.124) 3 Cl.; 2 Lab.; 4 Q.H.
Structure of the atom with emphasis on the nucleus; the characteristics and detection of alpha, beta, and gamma radiation; isotope formation, radioactive decay, nuclear reactions; cross sections for absorption, scattering, and fission; types of reactors, elementary reactor theory, reactor heat transfer, waste disposal, health physics, radiation detection, and uses of radioisotopes.
Prof. Foster Fall and Winter Qtrs.
- 2.126 Thermodynamics IV** 4 Cl.; 4 Q.H.
Selected subjects of current interest in thermodynamics, including elementary kinetic theory, statistical mechanics and quantum mechanics; discussion of their relationship to classical thermodynamics. Specialized problems in thermodynamics.
Prof. Nelson Spring Qtr.
- 2.127 Direct Energy Conversion** (Prereq. 2.123) 4 Cl.; 4 Q.H.
The principles of direct energy conversion by magnetohydrodynamic power generators, thermionic converters, fuel cells, and thermoelectric converters. The unified theory of energy conversion. Irreversible thermodynamics.
Prof. Zelinski Spring Qtr.
- 2.128 Thermodynamics** (Prereq. 2.120) 3 Cl.; 3 Q.H.
Thermodynamic principles and their application in engineering; availability, irreversibility, and efficiency; reciprocating machinery; power and refrigeration cycles.
Mr. Swanson Fall and Winter Qtrs.

2.140 Materials and Metallurgy

2 Cl.; 3 Lab.; 3 Q.H.

Structures of solids; imperfections in crystals; phase diagrams; effect of temperature on the structure and properties of materials (recrystallization, recovery, precipitation, diffusion); strengthening mechanisms; mechanical properties of materials; properties of the iron-carbon system and high temperature alloys:

Prof. Bruehl

Fall and Winter Qtrs.

2.141 Materials Science

(Prereq. 2.121) 3 Cl.; 3 Lab.; 4 Q.H.

Crystallography; structure of solids; imperfections in crystals; phase equilibrium basic mechanisms of metal strengthening and mechanical behaviour; and the effect of temperature on the structure and properties of materials (recrystallization, recovery, precipitation, rate processes).

Prof. Nowak

Spring and Summer Qtrs.

2.142 Materials and Processes

(Prereq. 2.141) 4 Cl.; 2 Lab.; 5 Q.H.

Ferrous metallurgy; plasticity theory; fracture and failure; metallurgical principles of casting, joining, forming, and cutting.

Prof. Murphy

Fall and Winter Qtrs.

2.143 Materials Science A

(Prereq. 11.104, 10.145) 3 Cl.; 3 Q.H.

A basic background in the physical properties of solids. This should be sufficient for students interested in a broad scope as well as those who wish to continue in the area. Specific material includes crystallography; structure of solids; crystal growth; imperfections in solids; phase equilibria; phase changes; effect of temperature on structure and properties of materials (rate processes, diffusion); and electric and optical properties of solids.

Prof. Nowak

Fall and Winter Qtrs.

2.160 Mechanical Engineering Laboratory I

(Prereq. 2.102, 9.103) 2 Cl.; 3 Lab.; 4 Q.H.

Principles of engineering experimentation and instrumentation, including the proper design of experiments to minimize experimental error and uncertainty; thorough introduction to the analog computer; stressed in lectures and in tests on machines particularly suited to illustrate above and commensurate with students' academic background.

Prof. Sexton

Fall and Winter Qtrs.

2.161 Mechanical Engineering Laboratory II

(Prereq. 2.160, 2.105, 2.123) 4 Lab.; 3 Q.H.

Further application of principles learned in 2.160 by drawing on the students' increased theoretical preparation in performing experiments on equipment illustrating the principles of thermodynamics, strength of materials, heat transfer and fluid mechanics. Effective use is made of the digital as well as the analog computer.

Prof. Sexton

Spring and Summer Qtrs.

2.162 Mechanical Engineering Laboratory III

(Prereq. 2.161, 2.142, 2.124, 2.106) 4 Lab.; 3 Q.H.

Project type experiments. Students are required to utilize principles learned in 2.160 and 2.161 by choosing, researching, designing and managing

experiments involving independent and, insofar as possible, original investigations in any of the fields of mechanical engineering that are of particular interest to them.

Prof. Sexton

Fall and Winter Qtrs.

2.191 Mechanical Engineering Senior Project

(Prereq. 2.161, and consent of Dept. Head) 4 Lab.; 3 Q.H.

This special project, if permitted, will be substituted for 2.162. Projects may be of an analytical, design, or experimental nature, and a formal report is submitted to the student's supervisor at the end of the quarter.

Prof. Sexton

Fall and Winter Qtrs.

2.214 Experimental Stress Analysis

4 Cl.; 4 Q.H.

Theory and application of mechanical and electrical strain gauges; installation, instrumentation and circuitry of gauge set-ups for transducer use and experimental stress analysis; use of brittle coatings; theory and practice of photoelastic methods as applied to models and coatings.

Prof. Mills

Spring Qtr.

2.232 Physical Metallurgy

(Prereq. 2.142 or equivalent) 4 Cl.; 4 Q.H.

Atomic structure and bonding; atomic basis for elasticity; anisotropic elastic behaviour; anelastic behaviour; equilibrium and non-equilibrium studies of one-, two-, and three-component systems; oxidation; corrosion; electrical and magnetic behaviour.

Prof. Zotos

Fall and Winter Qtrs.

Electrical Engineering

3.111 Circuit Theory I

3 Cl.; 3 Q.H.

Introductory course to electric circuit theory covering Kirchhoff's laws, network topology, loop and nodal analysis, Thevenin's theorem, dependent sources, two-part network analysis, power and energy.

Prof. Martin

Fall and Winter Qtrs.

3.112 Circuit Theory II

(Prereq. 3.111, 10.144) 3 Cl.; 3 Q.H.

An introduction to the properties of linear, time-invariant systems; exponential excitation, system function, complex-frequency plane, singularity function, impulse response.

Prof. Martin

Spring and Summer Qtrs.

3.113 Circuit Theory III

(Prereq. 3.112, 10.145) 3 Cl.; 3 Q.H.

Review and extension of selected introductory circuit theory techniques; analysis of nonlinear circuits; piecewise-linear analysis and synthesis techniques; phase-plane solution of simple nonlinear circuits; parametric circuits

Prof. Martin

Fall and Winter Qtrs.

3.114 Distributed Circuits and Waves

(Prereq. 3.113, 3.161) 3 Cl.; 3 Q.H.

Electromagnetic waves on transmission lines and in space; acoustic waves in waveguides and in fluids; transmission and absorption phenomena; radiation efficiency and impedance of antenna and electromechanical transducers.

Prof. Remillard

Spring and Summer Qtrs.

3.121 Signals and Systems I

(Prereq. 3.113, 10.147) 3 Cl.; 3 Q.H.

Introduction to complex variables with specific application to exponential transform theory; solution of differential equations and circuit analysis utilizing exponential transforms; signal flow graphs; root locus.

Prof. Schetzen

Spring and Summer Qtrs.

3.122 Signals and Systems II

(Prereq. 3.121) 3 Cl.; 3 Q.H.

Pulse, periodic, and random signals and their associated spectra; correlation, convolution, and sampling; probability distribution functions and random-variable theory; signal transmission through linear systems; singularity function.

Prof. Schetzen

Fall and Winter Qtrs.

3.123 Control Systems

(Prereq. 3.121) 3 Cl.; 3 Q.H.

Analysis and design of linear and nonlinear control systems; compensation methods, statistical design techniques, and stability analysis; introduction to sampled data systems.

Prof. Bach

Fall and Winter Qtrs.

3.131 E. E. Laboratory I — Measurements

(Prereq. 3.112) 1 Cl.; 3 Lab.; 3 Q.H.

Basic electrical measurements and the development of measuring systems; measurement techniques with error analysis; waveform errors in averaging type instruments; electric machinery and electronic circuits will be used as models for measurement.

Prof. Martin

Fall and Winter Qtrs.

3.132 E. E. Laboratory II — Measurements

(Prereq. 3.131) 1 Cl.; 3 Lab.; 3 Q.H.

A continuation of measurements laboratory with more sophisticated measurements; student projects involving the synthesis of a measuring system.

Prof. Martin

Spring and Summer Qtrs.

3.133 E.E. Laboratory III — Active Devices

(Prereq. 3.131, 3.141) 1 Cl.; 3 Lab.; 3 Q.H.

The terminal behavior of active devices; bandwidth, power gain, power level, dynamic range and operating bias; introduction to Analog Computation.

Prof. Martin

Fall and Winter Qtrs.

3.134 E. E. Laboratory IV — Transducers

(Prereq. 3.131, 3.122) 1 Cl.; 3 Lab.; 3 Q.H.

Analog computation, electro-optics and active devices including analysis and design.

Prof. Martin

Spring and Summer Qtrs.

3.135 E.E. Laboratory V

(Prereq. 3.134, 3.143, 3.171) 1 Cl.; 3 Lab.; 3 Q.H.

Analysis and design of multistage devices such as wave shaping circuits, basic logic systems, communication systems, amplifiers, transfer characteristics of electric machines; or senior thesis project.

Prof. Martin

Fall and Winter Qtrs.

3.136 E. E. Laboratory VI (Prereq. 3.123, 3.135, 3.143) 1 Cl.; 3 Lab.; 3 Q.H.
 Cont. of 3.135.
 Prof. Martin Spring Qtr.

3.141 Electronics I (Prereq. 3.113, 11.140) 3 Cl.; 3 Q.H.
 Development of the fundamental principles of operation of transistors and other devices from solid-state physics; development of circuit models for low-and high-frequency representation and piecewise-linear models; bias considerations and regions of operation for transistors and other electron devices.
 Prof. Cochrun Spring and Summer Qtrs.

3.142 Electronics II (Prereq. 3.121 3.141) 3 Cl.; 3 Q.H.
 The properties of simple amplifiers; development of gain, frequency response, and impedance relations in single-stage and cascaded RC and d-c amplifiers. Analysis techniques used, such as signal flow graphs, matrix methods, and log-modulus (Bode) plots, are related to the physical operation and limitations of the devices employed.
 Prof. Gabel Fall and Winter Qtrs.

3.143 Electronics III (Prereq. 3.142) 3 Cl.; 3 Q.H.
 The concepts of feedback developed and applied to amplifier circuits and waveform generators; the problems of gain, frequency response, interstage loading, and stability quantitatively discussed; analysis and design approaches for multivibrators, sweep circuits, and sinusoidal oscillators.
 Prof. Gabel Spring and Summer Qtrs.

3.151 Communications Theory and Practice (Prereq. 3.122, 3.143) 3 Cl.; 3 Q.H.
 Introduction to classical modulation theory and to some of the more recent developments in communication theory. AM and FM theory and models; sampling, pulse-modulation systems, multiplexing, and noise; signal space and correlation detection; entropy and channel capacity.
 Prof. Lob Fall and Winter Qtrs.

3.161 Field Theory I (Prereq. 10.147, 11.104) 3 Cl.; 3 Q.H.
 The basic principles of electromagnetic fields; vector analysis review; analogies between field and circuit concepts; fundamental quantities and units; electrostatic and magnetostatic fields; boundary conditions, Coulomb, Biot-Savart and Faraday's Laws; solutions of Laplace and Poisson equations for simple electrostatic configurations; electric and magnetic dipoles; Maxwell equations.
 Prof. Schwab Fall and Winter Qtrs.

3.162 Field Theory II (Prereq. 3.161) 3 Cl.; 3 Q.H.
 Resistance, capacitance and inductance from the field viewpoint; electric and magnetic polarization and susceptibility; complex fields; waves in dielectrics; power flow; reflection and refraction; standing waves; dipole radiation; introduction to waveguide and cavity concepts.
 Prof. Schwab Spring and Summer Qtrs.

3.163 Field Theory III

(Prereq. 3.162) 3 Cl.; 3 Q.H.

Introduction to modern applications of electromagnetic field theory; motion of charges particles in fields; electrostatic and magnetic deflection and focussing; diode, cyclotron, synchrotron, magneto-ionics, ferrites, electron beam-wave interactions; waves on periodic structures, traveling-wave tubes; elementary plasma physics concepts; magneto-hydrodynamics.

Prof. Schwab

Fall and Winter Qtrs.

3.171 Energy Conversion I

(Prereq. 3.113, 3.161) 3 Cl.; 3 Q.H.

Magnetics and magnetic circuits; the basic principles of electromagnetic energy conversion in translation and rotating devices; the idealized d-c machine with particular emphasis on the dynamic operating conditions.

Prof. Cleveland

Spring and Summer Qtrs.

3.172 Energy Conversion II

(Prereq. 3.171) 3 Cl.; 3 Q.H.

Static devices with emphasis on transformers; three-phase circuits, including application to transformer connections; the synchronous machine as an electromagnetic energy converter; consideration of both the steady-state and dynamic states of operation.

Prof. Cleveland

Fall and Winter Qtrs.

3.173 Energy Conversion III

(Prereq. 3.172) 3 Cl.; 3 Q.H.

The induction machine as a rotating energy conversion device; polyphase and single-phase induction motors; symmetrical component analysis applied to the unbalanced conditions; emphasis on the steady-state and dynamic operating conditions

Prof. Cleveland

Spring and Summer Qtrs.

3.181 Electrical Engineering I

(Prereq. 10.143) 3 Cl.; 3 Q.H.

Introductory course to electric circuit theory covering Kirchhoff's Laws, Loop and nodal analysis, Thevenin's Theorem, power, energy, exponential excitation and system function. Not open to E. E. majors.

Prof. Grabel

Fall and Winter Qtrs.

3.182 Electrical Engineering II

(Prereq. 3.181) 3 Cl.; 3 Q.H.

Properties and analysis of electronic devices, circuits, systems; elements of control systems; principles of energy conversion; emphasis on each topic determined according to major discipline. Not open to E.E. majors.

Prof. Grabel

Spring and Summer Qtrs.

3.183 Electrical Engineering I

(Prereq. 10.143) 4 Cl.; 4 Q.H.

Similar to 3.181. Offered only to I.E. majors.

Prof. Grabel

Fall and Winter Qtrs.

3.184 Electrical Engineering II

(Prereq. 3.183) 4 Cl.; 4 Q.H.

Similar to 3.183 but with more emphasis on ideas of system theory. Offered only to I.E. majors.

Prof. Grabel

Spring and Summer Qtrs.

3.215 Modern Circuit Theory

(Prereq. 3.122) 3 Cl.; 3 Q.H.

A review and integration of previously acquired knowledge of circuit theory, particularly with respect to circuit classification; the establishment of a philosophy of formal synthesis as a useful and informative part of engineering design; the development of an appreciation for the utility and intrinsic value of certain mathematical methods of analysis for linear systems; for example, matrices and other linear algebra concepts as applied to linear circuit theory.

Prof. Kellner

Spring Qtr.

3.221 Electrical Energy Systems and Sources

(Prereq. 3.171) 3 Cl.; 3 Q.H.

This course with 3.222 is designed to give a broad view of the structure of those electric systems whose primary function is energy transfer, and especially those whose function is the transfer of large quantities of energy. The functions of the various system elements are described and their significant characteristics are investigated briefly. The interrelation between elements is treated.

Prof. Cogbill

Fall and Winter Qtrs.

3.222 Electrical Energy Systems and Sources II (Prereq. 3.221) 3 Cl.; 3 Q.H.

A continuation of 3.221. Problems such as voltage control, protection, economics, and planning which relate to the system as a whole are investigated. Taken with 3.221, it provides a general background for more intensive studies in analysis, stability, protection, economics, and planning of electric power systems.

Prof. Cogbill

Spring Qtr.

2.234 E. E. Laboratory

(Prereq. 3.131, 3.122) 1 Cl.; 3 Lab.; 3 Q.H.

Similar to 3.134 except emphasizing power aspects where appropriate.

Prof. Cleveland

Spring and Summer Qtrs.

3.235 E. E. Laboratory

(Prereq. 3.234, 3.143, 3.171) 1 Cl.; 3 Lab.; 3 Q.H.

Similar to 3.135 except emphasizing power aspects where appropriate.

Prof. Cleveland

Fall and Winter Qtrs.

3.236 E. E. Laboratory

(Prereq. 3.235, 3.123, 3.172, 3.143) 1 Cl.; 3 Lab.; 3 Q.H.

Similar to 3.136 except emphasizing power aspects where appropriate.

Prof. Cleveland

Spring and Summer Qtrs.

3.241 Design Problems in Electronics

(Prereq. 3.143) 3 Cl.; 3 Q.H.

An introduction to the art of practical design through the use of specific design examples, such as feedback regulators. The specification compromises necessary to maximize the total usefulness of the circuit will be evolved, as will the experimental techniques necessary to verify the analytical design. An attempt will be made to interrelate many of the analytical concepts presented in earlier courses. Student participation encouraged; laboratory demonstrations provided.

Prof. Grabel

Spring Qtr.

3.242 Electronic Properties of Solids

(Prereq. 3.141) 3 Cl.; 3 Q.H.

This course will cover the electronic and thermal properties of metals, semiconductors and insulators. Subjects covered include band theory, introductory statistical mechanics, transport theory, and the theory of SS, Ms, and MOS junctions. The laboratory will be devoted to using the theory developed in lecture for the solution of realistic design and measurement problems.

Prof. Feldman

Fall and Winter Qtrs.

3.243 Semiconductor Devices, Theory and Practice

(Prereq. 3.242, 3.143) 3 Cl.; 3 Q.H.

This course covers the physical electronics of junction diodes; junction transistors, MOS and junction field-effect transistors, and closely related devices. In the laboratory, students will design and fabricate such devices, and analyze the effectiveness of their designs by electrical and optical inspection techniques.

Prof. Feldman

Spring Qtr.

3.291 Computer Applications in Science and Industry

(Prereq. 10.147) 3 Cl.; 3 Q.H.

Description of the computing facilities available for solution of today's engineering problems and an introduction to some methods of problem-solving. The advantages of hybrid computation are stressed. Representative problems will be chosen for solution either by digital computer or by analog computer under control of digital logic. Some familiarity with basic analog methods and the concepts of Boolean algebra is assumed.

Prof. Carrabes

Spring Qtr.

3.292 Mathematical Techniques in Electrical Engineering I

(Prereq. 3.122, 3.162) 3 Cl.; 3 Q.H.

Definition and representation of a complex variable and of functions of a complex variable. Topics covered include conformal mapping, singularities, Laurent series, residues, and contour integration. Electrical engineering applications of complex variable theory such as Fourier theory, Hilbert transforms, conformal transformations in the analysis of linear systems and in electrostatics.

Prof. Schwab

Fall and Winter Qtrs.

3.293 Mathematical Techniques in Electrical Engineering II

(Prereq. 3.113, 3.142) 3 Cl.; 3 Q.H.

Matrix notation and rules of matrix algebra are initially introduced from the historical point of view. The solubility of sets of linear equations, concepts of determinants, linear transformations, invariance, quadratic forms and eigenvalues are then developed. Throughout, illustrative applications of matrix techniques are made for the formulation and solution of certain problems in Electrical Engineering drawn from the realms of circuit theory, probability theory, and engineering physics.

Prof. Schwab

Spring Qtr.

Chemical Engineering

4.101 Chemical Engineering Calculations I

(Prereq. 12.116) 3 Cl.; 3 Lab.; 4 Q.H.

Application of the fundamental laws of mass and energy conservation and equilibrium concepts to chemical and physical processes; economic considerations leading to optimal solutions. A computational laboratory is included to improve the facility of the student in handling sophisticated problems. Analog and numerical approaches are stressed where applicable.
 Prof. Williams Fall and Winter Qtrs.

4.102 Chemical Engineering Calculations II

(Prereq. 4.101) 3 Cl.; 3 Q.H.

Simultaneous application of energy and mass conservation laws coupled with equilibrium considerations to comprehensive problems selected from the chemical processing industries; both steady and unsteady state processes.
 Prof. Buonopane Spring and Summer Qtrs.

4.104 Commercial Chemical Development

(Prereq. 4.101, 12.116) 3 Cl.; 3 Q.H.

Designed to enable the student to make the transition from theoretical chemistry to the industrial process. Interrelationships between processes are studied from the standpoint of economics, raw materials, and apparatus. Problems requiring qualitative as well as quantitative reasoning.
 Prof. Troupe Spring and Summer Qtrs.

4.111 Chemical Engineering I

(Prereq. 4.102) 3 Cl.; 3 Q.H.

The important unit operations of Chemical Engineering. Fluid mechanics, heat transfer, and evaporation.
 Prof. Keevil Fall and Winter Qtrs.

4.112 Chemical Engineering II

(Prereq. 4.111) 3 Cl.; 3 Q.H.

A continuation of 4.111. Drying, distillation, absorption, and extraction.
 Prof. Goodwin Spring and Summer Qtrs.

4.121 Transport Phenomena I

(Prereq. 4.112) 4 Cl.; 4 Q.H.

A study of Chemical Engineering from the transport phenomena standpoint. Introduction to fluid properties, derivations of the conservation equation for mass, momentum, and energy; solutions of differential equations in conduction; unsteady state heat transfer; and laminar fluid motion.
 Prof. Stewart Fall and Winter Qtrs.

4.122 Transport Phenomena II

(Prereq. 4.121) 4 Cl.; 4 Q.H.

A continuation of 4.121. Convective heat transfer, turbulent fluid motion, mass transfer by molecular and eddy diffusion; mass transfer in laminar and turbulent motion; and simultaneous heat, mass, and momentum transfer.
 Prof. Goodwin Spring and Summer Qtrs.

4.123 Experimental Methods I

(Prereq. 4.112) 2 Cl.; 4 Lab.; 4 Q.H.

Introduction to experimental engineering methods; basic measurements, design of experimental apparatus, laboratory report writing, design of experiments, and data accuracy are stressed. Suitable experiments are performed.
 Prof. Troupe Fall and Winter Qtrs.

4.124 Experimental Methods II

(Prereq. 4.123) 2 Cl.; 4 Lab.; 4 Q.H.

A continuation of 4.123 with emphasis on the development of an experimental program, reduction of data, and presentation of results; use of computers in simulating experimental conditions, and for constructing mathematical models are stressed.

Prof. Troupe

Spring and Summer Qtrs.

4.125 Material Science

(Prereq. 12.162, 12.148) 4 Cl.; 4 Q.H.

The properties and applications of metals, plastics, and ceramics in general, with particular emphasis given to those materials problems which are encountered in the chemical engineering profession; modern theories of solid-state physics emphasizing the molecular and structural concepts upon which the physical properties of engineering materials depend; also, the classical thermodynamic theories dealing with solids.

Prof. Miserlis

Fall and Winter Qtrs.

4.126 Chemical Engineering Thermodynamics

(Prereq. 4.102, 12.162) 4 Cl.; 4 Q.H.

The first law and its application to batch and flow systems; heat effects in chemical and physical processes; thermodynamic properties; the second law; entropy; physical and chemical equilibria; emphasis on the fundamental principles and mathematical relationships and their application to the analysis and solution of a variety of engineering problems.

Prof. Keevil

Spring and Summer Qtrs.

4.131 Process Design

(Prereq. 4.122, 4.126) 1 Cl.; 6 Lab.; 7 Q.H.

The class participates in the process design of a chemical plant capable of producing a specified annual tonnage of a chemical when specific raw materials are available. The fundamentals of chemical engineering science, practice, analysis and economics which have been studied in previous courses are used to prepare a report containing flow sheets, material and energy balances, designs of processing units, and cost estimates of the capital requirements for procuring, erecting, and operating the plant.

Prof. Miserlis

Fall and Summer Qtrs.

4.132 Process Design

(Prereq. 4.131) 1 Cl.; 6 Lab.; 7 Q.H.

Each student or a small group of students designs a chemical plant to produce a specified annual tonnage of one or more chemicals with a specific feed stock. The techniques used in Process Design I are used by each student to prepare an individual process design report and cost estimate for the particular plant assigned.

Prof. Miserlis

Spring Qtr.

4.133 Projects

(Prereq. Senior student and consent of Dept.) 1 Cl.; 6 Lab.; 7 Q.H.

Individual research related to some phase of chemical engineering. Open only to students selected by the department head on the basis of scholarship and proved ability. Research topic selected by mutual agreement of the student and his supervising professor.

Prof. Troupe and Staff

Fall and Winter Qtrs.

212 / INDUSTRIAL ENGINEERING

- 4.134 Projects** (Prereq. 4.133) 1 Cl.; 7 Lab.; 7 Q.H.
A continuation of the research work undertaken in 4.133.
Prof. Troupe and Staff Spring Qtr.
- 4.135 Introduction to Nuclear Engineering** (Prereq. 10.147; 11.104) 4 Cl.; 4 Q.H.
Review of nuclear physics; nuclear fission, the nuclear chain reaction; reactor theory, radiation shielding; materials of construction; reactor instrumentation and control; separation of stable isotopes; chemical separation; processing and special techniques of nuclear engineering.
Prof. Buonopane Fall and Winter Qtrs.
- 4.136 Chemical Engineering Kinetics** (Prereq. 12.162, 4.126) 4 Cl.; 4 Q.H.
Fundamental theories of a rate of chemical change including collision and transition state theory in homogeneous reacting systems; integral and differential analysis of kinetic data and a design of batch and continuous flow chemical reactors; catalysis theory and design of catalytic reactors.
Prof. Williams Spring Qtr.
- 4.141 Junior Honors Program** Prereq. Approval of Dept.; To be assigned.
Those students undertaking a Junior Honors Program may petition for two credits for the research problem undertaken.
Prof. Troupe All Quarters
- 4.146 Nuclear Power Engineering** (Prereq. 10.147, 11.104) 3 Cl.; 3 Q.H.
Course for Electrical Engineering Power Systems students. Introduction to Nuclear Engineering; fundamental concepts of nuclear power; nuclear reactors and power plants; radiation protection and safety. Supplementary laboratory experiments.
Prof. Buonopane Spring and Summer Qtrs.

Industrial Engineering

- 5.128 Work Design** 3 Cl.; 3 Lab.; 4 Q.H.
Philosophy and Principles of Work Design, use of graphic models such as Process Charts, Operation Charts, Man-machine Charts, etc. Work Measurement techniques including stop watch, synthetic standard and work sampling. Extensive use of projects.
Prof. Hulbert Spring and Summer Qtrs.
- 5.129 Manufacturing Processes and Value Analysis** 3 Cl.; 2 Lab.; 4 Q.H.
Principles and techniques in processes for the manufacture of articles of commerce, emphasis on process design and cost, consideration of process control and automation; metal working, forming, machining, and bonding; job-shop tooling and techniques; plastics and rubber forming and extruding; textiles, paper, electronics, food processing, and other manufacturing operations. Principles and procedures to obtain optimum value in products, complete value analysis study; methods of revealing excessive costs; concepts of government contracts; relationship of value analysis to design, manufacturing, procurement and installation. Emphasis on values added resulting from choice of manufacturing process.
Prof. Hulbert Spring and Summer Qtrs.

5.130 Systems I

(Prereq. 10.146) 4 Cl.; 4 Q.H.

Linear feedback systems and solutions for steady state in first order systems. Integral and derivative control. LaPlace transforms for continuous systems analysis and Z-transforms in discrete systems. Transfer functions.

Prof. Freeman

Not offered 1968-69

5.131 Systems II

4 Cl.; 4 Q.H.

Continuation of Systems I with emphasis on applications; Inventory systems, distribution systems, information systems; introduction to simulation of large systems with analog and digital computers.

Prof. Freeman

Spring Qtr.

5.144 Quality Control

(Prereq. 5.245) 3 Cl.; 3 Q.H.

Sampling inspection procedures involving both attributes and variables, single and double sampling plans, control charts for fraction defective, variables control charts, operating characteristics curves, Military Standard Sampling Plans. Not open to Industrial Engineers.

Prof. Buoncristiani

Spring Qtr.

5.146 Engineering Statistics

3 Cl.; 3 Q.H.

Civil Engineering applications of fundamental probability distributions, including the Binomial, Exponential, Poisson and Hypergeometric; conditional probability; addition and multiplication laws; statistical inference with testing of hypotheses on variability and central tendency; and curve fitting with least squares.

Prof. Buoncristiani

Spring Qtr.

5.147 Statistics I

(Prereq. 10.208) 4 Cl.; 4 Q.H.

What is a statistic, distributions of random variables including normal, t, Chi-square, F, poisson, binomial; Estimation of parameters-point estimation by method of moments, maximum likelihood, Bayes estimates.

Prof. Buoncristiani

Spring and Summer Qtrs.

5.148 Statistics II

(Prereq. 5.147) 4 Cl.; 4 Q.H.

Interval estimation; stating and testing hypothesis; Linear Regression; Analysis of Variance; Applied topics such as Reliability, Quality Control, Decision Theory from Bayes Rule.

Prof. Buoncristiani

Fall and Winter Qtrs.

5.149 Reliability and Quality Control

(Prereq. 5.148) 3 Cl.; 3 Lab.; 4 Q.H.

Applied probability and statistical inference techniques are utilized in reliability analysis and quality control. Both theory and application are discussed in relation to the total quality assurance program.

Mr. Slater

Spring and Summer Qtrs.

5.161 Operations Research I

4 Cl.; 4 Q.H.

Deterministic models including L.P. and Duality; Transportation and Allocation; Sensitivity and post optimality analysis; Network Analysis including maximal flow, shortest route, and PERT; Dynamic Programming and recursive functional expressions; Game Theory.

Prof. Freeman

Fall and Winter Qtrs.

5.163 Operations Research II

(Prereq. 10.208) 4 Cl.; 4 Q.H.

Stochastic models in O.R., their analytical development and solution. Topics covered: Queuing models, deterministic and stochastic inventory models, Markov Chains, sequencing.

Prof. Freeman

Spring and Summer Qtrs.

5.165 Production and Inventory Control

4 Cl.; 4 Q.H.

Study of both deterministic inventory models and models with stochastic demand and/or lead time. Single period and multiple period models to be developed. Emphasis on cost structure and determination of optimum policies. Relationship to workload planning, scheduling and dispatching.

Mr. Slater

Fall and Winter Qtrs.

5.166 Facilities Planning and Design

3 Cl.; 3 Lab.; 4 Q.H.

Application of quantitative techniques such as queuing theory and engineering economy to problems involving facilities planning and materials handling; basic graphical tools; models for plant layout; laboratory projects.

Prof. Moore

Fall and Winter Qtrs.

5.169 Advanced Topics in Operations Research

4 Cl.; 4 Q.H.

Topics to include duality Kuhn-Tucker conditions, Lagrangian Techniques, static and dynamic stochastic decision processes, model formulation and analysis.

Prof. Freeman

Spring Qtr.

5.186 Personnel & Organizations

4 Cl.; 4 Q.H.

The individual in the industrial environment; work theory, motivation, interpersonal relations; consideration of modern personnel practice based on the concepts of the behavioral sciences; structure and dynamics of industrial organizations; problems of innovation; case studies for situational analysis.

Prof. Fisher

Fall and Winter Qtrs.

5.187 Industrial Relations

4 Cl.; 4 Q.H.

Analysis of industrial relations and organized labor with emphasis on the historical developments leading to their current status; union organization and philosophy; interaction of management, government and labor; collective bargaining; the engineer's role in industrial relations.

Prof. Fisher

Spring and Summer Qtrs.

5.240 Digital Simulation Techniques

4 Cl.; 4 Q.H.

Design of simulation experiments, construction of the computer model, pseudo-random number generation, simulation logic and flow charting, testing and validation of models, applications drawn from physical sciences, engineering business, industry medicine, government and the social sciences.

Prof. Moore

Fall and Winter Qtrs.

5.241 Management Information Systems

4 Cl.; 4 Q.H.

Determination of what type of information management requires for reasonable decision-making and how it should be collected, stored, summarized, and reported for maximum utilization on the part of the industrial firm.

Mr. Meyer

Spring and Summer Qtrs.

5.245 Basic Engineering Statistics

4 Cl.; 4 Q.H.

Introduction to basic probability distributions, including the Binomial and Hypergeometric, Exponential, Poisson and normal; laboratory data analysis; statistical test of hypotheses about central tendency and variability; curve fitting with least squares on Engineering data.

Prof. Hall

Spring and Summer Qtrs.

5.260 Engineering Economy

4 Cl.; 4 Q.H.

The formulation of analytical techniques such as rate of return, present worth, annual cost. The application of these techniques to reach economical solutions to business and engineering problems involving design, relection, replacement, lease-buy-decisions, and decisions between multiple alternatives. Sensitivity analysis and basic probability are introduced in cases where uncertainty exists. Brief survey of sources and costs of capital, debt versus equity financing and leverage.

Prof. Hall

Spring and Summer Qtrs.

5.265 Fundamentals of Engineering Economy

3 Cl.; 3 Q.H.

The formulation of analytical techniques such as rate of return, present worth, annual cost. The application of these techniques to reach economical solutions to business and engineering problems involving design, relection, replacement, lease-buy-decisions, and decisions between multiple alternatives. Sensitivity analysis and basic probability are introduced in cases where uncertainty exists. A brief review of accounting is used as background for extensive emphasis on income taxation and its effects on decision making.

Prof. Hall

All Quarters

5.290 Independent Study in Industrial Engineering

1-4 Cl.; 1-4 Q.H.

For students usually in the senior year with high scholastic standing on advanced I.E. topics. Projects may be of an applied or theoretical nature; formal report submitted to student's project supervisor at the end of quarter.

Advisor

All Quarters

Graphic Science

9.101 Graphic Science

3 Cl.; 2 Lab., 4 Q.H.

Introduction to basic engineering and design concepts. Analysis and review of a variety of Case Studies noting how scientific principles are applied to the solution of engineering problems. Engineering drawings; introduction to computer programming.

Prof. Lang and Staff

Fall Qtr.

9.102 Graphic Science

2 Cl.; 2 Lab.; 3 Q.H.

Involvement with several specific professional disciplines of Engineering through standard components and group design projects. Analysis and evaluation of existing design systems; communicating design concepts. Applications of computer programming to Scientific and Engineering problems.

Prof. Lang and Staff

Winter Qtr.

9.103 Graphic Science

2 Cl.; 2 Lab.; 3 Q.H.

Creative Design and conceptual solutions to engineering problems. Involvement in original design problems; application of the design process. Computers as an aid to the Designer; computer graphics; numerical methods.

Prof. Lang and Staff

Spring and Summer Qtrs.

9.111 Introduction to Digital Computation

1 Cl.; 0 Q.H.

This course demonstrates the methods and techniques of programming digital computers. Emphasis is on general programming principles which are applicable to the full spectrum of electronic digital computers. The student is taught a typical computer language called FORTRAN and is shown the capabilities of this language through the use of case studies. These case studies show the application of digital methods in the solution of scientific and engineering-oriented problems.

Prof. Rule

Fall Qtr.

9.112 Advanced Programming Principles

1 Cl.; 0 Q.H.

Higher-level capabilities of the computer are developed by introducing more sophisticated aspects of the FORTRAN language. Computer logic and iterative procedures are emphasized through case studies that introduce the student to numerical methods.

Prof. Rule

Winter Qtr.

9.113 Engineering Applications and Numerical Methods

1 Cl.; 1 Q.H.

The more prominent numerical methods and mathematics associated with digital computation are explored and applied to solve engineering problems. Professionally written programs are reviewed as case studies to demonstrate advanced techniques. Programs available as Library Subprograms (Scientific Programming Package) are reviewed.

Prof. Rule

Spring Qtr.

9.124 Chart Analysis

4 Cl.; 4 Q.H.

Evaluations and calculations from available data through the analysis of charts and graphs.

Prof. Kreimer

Spring and Summer Qtrs.

9.126 Elements — Nomography

4 Cl.; 4 Q.H.

Graphical solutions designed to fit specific equations.

Mr. Kopecki

Summer Qtr.

9.128 Methods in Illustration

4 Cl.; 4 Q.H.

Application of illustration techniques, involving various media and graphic methods of communication. Designed for students majoring in the Arts, Sciences, and Education. Drawing skills not required.

Prof. Lang

Summer Qtr.

Mathematics

10.101 Basic Mathematics

3 Cl.; 3 Q.H.

Development of real numbers and the algebraic operations with emphasis placed on the field postulates. Study of polynomials, fractions, exponents, radical expressions, 1st and 2nd degree equations, solutions of inequalities, relations and functions.

Profs. Claflin and Shepardson

Fall Qtr.

10.102 Basic Mathematics

(Prereq. 10.101) 3 Cl.; 3 Q.H.

Continuation of functions and relations, graphs, simple forms of conic sections, variation, exponential and logarithmic functions, systems of equations and inequalities, complex numbers.

Profs. Claflin and Shepardson

Winter Qtr.

10.103 Basic Mathematics

(Prereq. 10.102) 3 Cl.; 3 Q.H.

Theory of equations, sequences and series, probability, topics in trigonometry.

Profs. Claflin and Shepardson

Spring Qtr.

10.104 Fundamentals of Mathematics

(Prereq. 1 unit high school algebra) 4 Cl.; 4 Q.H.

Primarily for upper-class Business Administration and non-science Liberal Arts students.

Numerical systems; review of algebraic processes; solutions of linear and quadratic equations and inequalities; elementary matrix operations with applications; permutations, combinations, and probability.

Profs. McCallister and Shepardson

Fall and Winter Qtrs.

10.105 Fundamentals of Mathematics

(Prereq. 10.104 or equivalent) 4 Cl.; 4 Q.H.

Selected topics in analytic geometry; number sequences; limits and continuity of functions; geometric interpretation of a derivative; derivatives by formula; applications of derivatives to curve sketching and problem solving.

Profs. McCallister and Shepardson

Spring and Summer Qtrs.

10.106 Calculus

(Prereq. 3½ units of coll. prep. math. or 10.103, 10.105, or 10.123)

4 Cl.; 4 Q.H.

A first course for upper-class students. Differential calculus of one variable; topics in analytic geometry.

To be announced

Fall and Winter Qtrs.

10.107 Calculus

(Prereq. 10.106) 4 Cl.; 4 Q.H.

Integral calculus of one variable with an introduction to differential equations.

To be announced

Spring and Summer Qtrs.

10.111 Calculus

(Prereq. 3½ units coll. prep. math.) 3 Cl.; 3 Q.H.

A first course in calculus for freshmen majoring in Chemistry, Biological Sciences, and Pharmacy. Limits, particularly the derivative; topics in analytic geometry related to the application of the derivative.

Prof. Blackett

Fall Qtr.

10.112 Calculus

(Prereq. 10.111) 3 Cl.; 3 Q.H.

Differentiation and integration of functions, with applications; topics in analytic geometry, including calculations of areas of plane figures bounded by algebraic curves. Further techniques of evaluation of limits.

Prof. Blackett

Winter Qtr.

10.113 Calculus

(Prereq. 10.112) 3 Cl.; 3 Q.H.

Transcendental functions and their derivatives and integrals; parametric functions; applications of definite integrals and other limits.

Prof. Blackett

Spring Qtr.

10.121 Fundamentals of Mathematics

(Prereq. 1 unit H.S. Algebra) 3 Cl.; 3 Q.H.

Primarily for freshman Business Administration students. Sets and set operations; number systems; operations with polynomials and rational expressions; exponents and radicals; linear and quadratic equations; graphs of relations and functions.

To be announced

Fall Qtr.

10.122 Fundamentals of Mathematics

(Prereq. 10.121 or equivalent) 3 Cl.; 3 Q.H.

Logarithms and applications; systems of equations and inequalities; matrices and determinants, with applications to solving systems of equations.

To be Announced

Winter Qtr.

10.123 Fundamentals of Mathematics

(Prereq. 10.122 or equivalent) 3 Cl.; 3 Q.H.

Complex numbers and vectors; sequences and series; permutations and combinations; probability, decision making; symbolic logic.

To be announced

Spring Qtr.

10.141 Calculus

(Prereq. 3 units coll. prep. math.) 4 Cl.; 4 Q.H.

A course in calculus for freshmen in the College of Engineering.

Introduction to analytic geometry, and to the differential and integral calculus of algebraic functions; inequalities, functions and graphs; limits and continuity; mean-value theorem and applications.

Prof. Klein and Staff

Fall Qtr.

- 10.142 Calculus** (Prereq. 10.141) 4 Cl.; 4 Q.H.
 Differential calculus applied to maximum-minimum and rate problems; the differential; the definite integral and areas; the indefinite integral; circles and conics.
 Prof. Klein and Staff Winter Qtr.
- 10.143 Calculus** (Prereq. 10.142) 4 Cl.; 4 Q.H.
 The differential and integral calculus of transcendental functions; parametric equations; polar coordinates; vector algebra and differentiation; techniques of integration with geometric applications.
 Prof. Klein and Staff Spring Qtr.
- 10.144 Calculus** (Prereq. 10.143) 4 Cl.; 4 Q.H.
 Solid analytic geometry, vectors, infinite series, partial differentiation.
 Prof. Balser Fall and Winter Qtrs.
- 10.145 Calculus** (Prereq. 10.144) 4 Cl.; 4 Q.H.
 Multiple integration, linear algebra, vector spaces, matrix algebra, complex variables.
 Prof. Balser Spring and Summer Qtrs.
- 10.146 Mathematical Analysis** (Prereq. 10.145) 3 Cl.; 3 Q.H.
 Introduction to numerical methods for engineering problems, employing the digital computer in root-evaluation, interpolation, and integration. Ordinary differential equations, including solution of first order equations and linear equations with constant coefficients.
 Prof. Filgo Fall and Winter Qtrs.
- 10.147 Mathematical Analysis** (Prereq. 10.146) 3 Cl.; 3 Q.H.
 Ordinary differential equations, including numerical and series solutions; Fourier series; introduction to partial differential equations and boundary-value problems.
 Prof. Filgo Spring and Summer Qtrs.
- 10.170 Geometry** (Prereq. A course in Calculus) 4 Cl.; 4 Q.H.
 Selected topics from advanced plane geometry in Euclidean style, such as collinear points, concurrent lines, duality, cross-ratio, harmonic division of segments, homogeneous coordinates, abridged notations, special theorems concerning points, lines, triangles, and circles (Euler, Desargues, Lemoine, Brocard, Brianchon, Feuerbach); the Nine Point Circle, inversion, reciprocation.
 Prof. Dean Fall and Winter Qtrs.
- 10.171 Geometry** (Prereq. 10.170) 4 Cl.; 4 Q.H.
 Discussion of Euclid's definitions and postulates; examination in detail of the Fifth Postulate and other items leading to Non-Euclidean Geometry. Some special topics in Non-Euclidean Geometry of the Hyperbolic and Elliptic planes.
 Prof. Dean Spring and Summer Qtrs.

- 10.195 Honors Calculus** (Prereq. Advanced Placement) 5 Cl.; 5 Q.H.
An accelerated course in the calculus of functions of one variable.
Prof. Sorani Fall Qtr.
- 10.201 Calculus** (Prereq. 3½ units coll. prep. math.) 5 Cl.; 5 Q.H.
A first course in calculus for freshman majoring in mathematics or physics. Basic properties of sets; the real number system. Functions, the Riemann integral and its properties, limits and continuity.
Prof. Klein and Staff Fall Qtr.
- 10.202 Calculus** (Prereq. 10.201) 5 Cl.; 5 Q.H.
Properties of continuous functions defined on a closed bounded interval, derivatives, extreme values, mean-value theorem. Partial derivatives, primitives, fundamental theorem of the integral calculus. Integration by substitution and by parts, the logarithm, the exponential and the inverse trigonometric functions. Taylor's formula with remainder, indeterminate forms and l'Hopital's rule.
Prof. Klein and Staff Winter Qtr.
- 10.203 Algebra** 5 Cl.; 5 Q.H.
Elementary linear algebra; vectors in 2 and 3 dimensions; linear transformations and matrices; vector spaces over real numbers; systems of linear equations; determinants; characteristic values and vectors.
Prof. Klein and Staff Spring Qtr.
- 10.204 Calculus** (Prereq. 10.202 or equivalent) 4 Cl.; 4 Q.H.
Extremum problems and indeterminate forms; sequences and series; Taylor's theorem; set functions; multiple integration.
Prof. Gilmore Fall and Winter Qtrs.
- 10.205 Calculus** (Prereq. 10.204) 4 Cl.; 4 Q.H.
Partial differentiation; vector calculus; line and surface integrals; Green's and Stokes' theorems.
Prof. Gilmore Spring and Summer Qtrs.
- 10.206 Algebra** (Prereq. 10.203) 4 Cl.; 4 Q.H.
Fundamentals of modern algebra. Mathematical induction; equivalence relations; groups; subgroups; cyclic groups; homomorphism; rings; ideals; polynomial rings; integral domains; congruences; fields.
Prof. Gorenstein Fall and Winter Qtrs.
- 10.207 Differential Equations** (Prereq. 10.204) 4 Cl.; 4 Q.H.
Solution of elementary ordinary differential equations; first order equations; higher order linear equations; series solutions.
Prof. Epstein Spring and Summer Qtrs.
- 10.208 Probability** (Prereq. 10.204) 4 Cl.; 4 Q.H.
Probability functions for finite and infinite sample spaces; conditional probability and independence; discrete and continuous probability distributions

for one or more random variables; expectation; moments; moment-generating functions; central limit theorem.

Prof. Stubbs

Spring and Summer Qtrs.

10.220 Mathematical Statistics

(Prereq. 10.208) 4 Cl.; 4 Q.H.

Estimation of parameters; confidence intervals; hypothesis testing; regression; sampling distributions; introduction to analysis of variance and statistical decision theory.

Prof. Staknis

Fall and Winter Qtrs.

10.221 Applied Analysis

(Prereq. 10.203, 10.207, 10.252) 4 Cl.; 4 Q.H.

Review of elementary linear algebra; functions of a matrix; bilinear and quadratic forms; spectral theory; applications include systems of first order linear differential equations.

Prof. Filgo

Fall and Winter Qtrs.

10.222 Applied Analysis

(Prereq. 10.221) 4 Cl.; 4 Q.H.

Series expansions; function spaces; integral equations; study of the partial differential equations associated with wave propagation, heat, and diffusion.

Prof. Filgo

Spring and Summer Qtrs.

10.223 Numerical Analysis

(Prereq. 10.203, 10.252, 10.220) 4 Cl.; 4 Q.H.

Solution of nonlinear equations and systems of linear and nonlinear equations; approximation; interpolation; smoothing; numerical integration and differentiation.

Prof. Klein

Fall and Winter Qtrs.

10.224 Numerical Analysis

(Prereq. 10.223) 4 Cl.; 4 Q.H.

Numerical solution of ordinary differential equations; accuracy and stability; numerical solution of boundary value and initial value problems in partial differential equations and integral equations.

Prof. Klein

Spring and Summer Qtrs.

10.225 Computers and Logic

(Prereq. 10.205, 10.206 or equivalents) 4 Cl.; 4 Q.H.

Introduction to computer programming; machine, assembler, and compiler languages with practice on CDC 3300 on campus; selected topics from Boolean algebra with application to logical design and mathematical machine theories.

To be announced

Spring and Summer Qtrs.

10.226 Functions of a Complex Variable

(Prereq. 10.251) 4 Cl.; 4 Q.H.

Complex analytic functions; elementary functions and mappings; contour integrals; series representation.

Prof. Filgo

Fall and Winter Qtrs.

10.230 Linear Programming and Game Theory

(Prereq. 1 year college math.) 4 Cl.; 4 Q.H.

Introduction to linear programming, game theory, and linear economic models.

Prof. Klein

Spring and Summer Qtrs.

- 10.251 Analysis** (Prereq. 10.203, 10.205) 4 Cl.; 4 Q.H.
Real numbers and Elementary Topology of \mathbb{R}^n . Continuity, properties of continuous functions, uniform continuity. Sequences of functions, uniform convergence.
Prof. Frampton Fall and Winter Qtrs.
- 10.252 Analysis** (Prereq. 10.251) 4 Cl.; 4 Q.H.
Riemann integration, differentiability. Contraction mapping principle, inverse and implicit function theorems.
Prof. Frampton Spring Qtr.
- 10.253 Analysis** (Prereq. 10.252) 4 Cl.; 4 Q.H.
Multilinear algebra and forms. Poincaré's lemma, generalized Stokes Theorem.
To be announced Fall and Winter Qtrs.
- 10.254 Algebra** (Prereq. 10.206 or equivalent) 4 Cl.; 4 Q.H.
Theory of groups and rings; factor groups; isomorphism theorems; Sylow theorems; direct products; Euclidean rings; modules; quotient fields.
Mr. Rasala Fall and Winter Qtrs.
- 10.255 Algebra** (Prereq. 10.254) 4 Cl.; 4 Q.H.
Vector spaces and linear transformations: bases; inner product spaces; orthogonal and normal matrices; quadratic forms, equivalence; similarity and canonical forms for matrices.
Mr. Rasala Spring and Summer Qtrs.
- 10.256 Algebra** (Prereq. 10.255) 4 Cl.; 4 Q.H.
Theory of fields: field extensions; automorphisms; Galois theory; applications to theory of equations.
Mr. Bridger Fall and Winter Qtrs.
- 10.261 Projective Geometry** (Prereq. 10.205, 10.206) 4 Cl.; 4 Q.H.
Analytic and synthetic projective geometry. Coordinatization of the Desarguan plane; collineation groups; n -dimensional projective space.
Prof. Gorenstein Fall and Winter Qtrs.
- 10.262 Differential Geometry** (Prereq. 10.205, 10.206) 4 Cl.; 4 Q.H.
Curves in space; properties of surfaces; differentiable manifolds; tangent spaces; curvature.
To be announced Spring and Summer Qtrs.
- 10.263 Topology** (Prereq. 10.205) 4 Cl.; 4 Q.H.
Metric spaces; topological spaces; continuity; separation axioms; compactness; connectedness; complete metric spaces.
Prof. Staknis Fall and Winter Qtrs.
- 10.271 Foundations of Mathematics** (Prereq. 10.252, 10.206) 4 Cl.; 4 Q.H.
Logic; sets and relations; axiom of choice; cardinal and ordinal numbers.
To be announced Fall and Winter Qtrs.

- 10.272 Foundations of Mathematics** (Prereq. 10.271) 4 Cl.; 4 Q.H.
 Properties of axiomatic systems; the real number system and other abstract spaces.
 To be announced Spring and Summer Qtrs.
- 10.274 Number Theory** (Prereq. 10.205, 10.206) 4 Cl.; 4 Q.H.
 The properties of positive integers; divisibility; congruences; quadratic residues; Diophantine equations.
 To be announced
- 10.295, 10.296, 10.297, 10.298 Honors Program** (each) 1 Cl.; 4 Q.H.
 Staff All Quarters

Physics

- 11.101 Physics** 3 Cl.; 3 Q.H.
 Vector algebra; stable equilibrium of particles and rigid bodies; kinematics of particle motion; Newton's laws; laws of gravitation; projectile motion; circular motion.
 Staff Fall Qtr.
- 11.102 Physics** (Prereq. 11.101) 3 Cl.; 3 Q.H.
 Work; kinetic and potential energy; conservative forces; conservative laws for energy and momentum; elastic and inelastic collisions; rotational motion; moment of inertia; conservation of angular momentum; simple harmonic motion.
 Staff Winter Qtr.
- 11.103 Physics** (Prereq. 11.102) 3 Cl.; 3 Q.H.
 Temperature; heat energy; heat capacity; mechanical equivalent of heat; wave motion; wave energy and momentum; wave velocity; Huygen's principle; reflection; boundary conditions; resonance; Doppler's effect; vibration of strings; damped oscillations.
 Staff Spring Qtr.
- 11.104 Physics** (Prereq. 11.103, 10.143) 3 Cl.; 3 Q.H.
 Electric charge; electric field; Gauss' law; electric potential; capacitors and dielectrics; electric current; electric circuits; magnetic field; Ampere's law.
 Staff Fall and Winter Qtrs.
- 11.105 Physics** (Prereq. 11.104) 3 Cl.; 3 Q.H.
 Faraday's law; inductance; a-c circuits; electromagnetic waves; light; reflection; refraction; interference; diffraction; polarization.
 Staff Spring and Summer Qtrs.
- 11.110 Physics Laboratory** (Prereq. 11.103) 3 Lab.; 1 Q.H.
 Introduction to physical measurements; selected experiments from mechanics, thermodynamics, electricity.
 Prof. Glaubman Fall and Winter Qtrs.

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- 11.111 Physics Laboratory** (Prereq. 11.110) 3 Lab.; 1 Q.H.
Selected experiments from various fields of physics, including electromagnetism, optics, modern physics.
Prof. Glaubman Spring and Summer Qtrs.
- 11.120 Physics** (Prereq. 10.143) 4 Cl.; 4 Lab.; 5 Q.H.
Vector algebra; statics of particles and rigid bodies; kinematics of particle motion; Newton's laws; circular motion; conservation laws of energy and momentum; moment of inertia; simple harmonic motion; temperature; heat capacity; mechanical equivalent of heat; wave motion.
Prof. Wallace Fall and Winter Qtrs.
- 11.121 Physics** (Prereq. 11.120; 10.113) 4 Cl.; 4 Lab.; 5 Q.H.
Electrostatics; Gauss' law; electric currents and circuits; magnetic field; Ampere's and Faraday's laws; a-c circuits; electromagnetic waves; reflection; refractions; interference; diffraction; polarization.
Prof. Wallace Spring and Summer Qtrs.
- 11.130 General Physics** (Prereq. 10.103) 4 Cl.; 4 Q.H.
A survey of Newtonian mechanics; methods of measurement; laws of rectilinear motion; uniform motion; equations of equilibrium; mechanics of liquids. Lectures and demonstrations are coupled with problems solvable by algebraics or trigonometric methods only.
To be announced Fall and Winter Qtrs.
- 11.131 General Physics** (Prereq. 11.130) 3 Cl.; 3 Lab.; 4 Q.H.
Wave motion, sound, heat, electricity and magnetism.
To be announced Fall and Winter Qtrs.
- 11.132 General Physics** (Prereq. 11.131) 3 Cl.; 3 Lab.; 4 Q.H.
Optics; elementary modern physics.
To be announced Spring and Summer Qtrs.
- 11.136 Basic Physics** (Prereq. 10.101) 3 Cl.; 3 Lab.; 4 Q.H.
Methods of measurement; rectilinear and curvilinear motion; Newton's Laws; wave motion and sound; some topics in heat and the mechanics of fluids.
Prof. Lacount Fall and Winter Qtrs.
- 11.137 Basic Physics** (Prereq. 11.136) 3 Cl.; 3 Lab.; 4 Q.H.
Electricity and magnetism; introduction to direct and alternating current; introductory electronics; and certain topics in optics; some discussion of X radiation and elementary modern physics.
Prof. Lacount Spring and Summer Qtrs.
- 11.140 Solid State Electronics** (Prereq. 11.104, 10.205) 3 Cl.; 3 Q.H.
Introduction to the application of solid state to electronics; structure of the solid state, and electron emission.
Prof. Gottschalk Fall and Winter Qtrs.

- 11.151 Physics** 3 Cl.; 3 Q.H.
 Vector algebra; stable equilibrium of particles and rigid bodies; kinematics of particle motion; Newton's laws; law of gravitation; projectile motion; circular motion.
 Prof. Aaron Fall Qtr.
- 11.152 Physics** (Prereq. 11.151) 3 Cl.; 3 Q.H.
 Work; kinetic and potential energy; conservation forces; conservation laws for energy and momentum; elastic and inelastic collisions; rotational motion; moment of inertia; conservation of angular momentum; simple harmonic motion.
 Prof. Aaron Winter Qtr.
- 11.153 Physics** (Prereq. 11.152) 3 Cl.; 3 Q.H.
 Temperature; heat energy; heat capacity; mechanical equivalent of heat; wave motion; wave energy and momentum; wave velocity; Huygen's principle; reflection; boundary conditions; resonance; Doppler's effect; vibrations of strings; damped oscillations.
 Prof. Aaron Spring Qtr.
- 11.154 Physics** (Prereq. 11.153, 10.203) 4 Cl.; 4 Q.H.
 Electric charge; electrified; Gauss' law; electric potential; capacitors and dielectrics; electric current; electric circuits; magnetic field; Ampere's law.
 Prof. Lutz Fall and Winter Qtrs.
- 11.155 Physics** (Prereq. 11.154) 4 Cl.; 4 Q.H.
 Faraday's law; inductance; a-c circuits; electromagnetic waves; light; reflection; refraction; interference; diffraction; polarization.
 Prof. Lutz Spring and Summer Qtrs.
- 11.162 Physics Laboratory** *1 Cl.; *3 Lab.; 1 Q.H.
 *Laboratory meets every other week for 3 hours with 1 hour recitation on alternate weeks.
 Mechanics
 Prof. Glaubman Winter Qtr.
- 11.164 Physics Laboratory** (Prereq. 11.162) *1 Cl.; *3 Lab.; 1 Q.H.
 *Laboratory meets every other week for 3 hours with 1 hour recitation on alternate weeks.
 Emphasis on electromagnetic theory.
 Prof. Glaubman Fall and Winter Qtrs.
- 11.170 Survey of Contemporary Physics** (Prereq. 11.152) 3 Cl.; 3 Q.H.
 A descriptive course in modern physics. Topics will include special relativity, the wave nature of matter, and elementary particles.
 Prof. Alster Fall and Winter Qtrs.
- 11.200 Mechanics I** (Prereq. 11.154, 10.205) 4 Cl.; 4 Q.H.
 Vector analysis; kinematics and dynamics of a particle; generalized coordinates and Lagrange's equations of motion; conservative forces; electrodynamics.
 Prof. Widom Fall and Winter Qtrs.

- 11.201 Mechanics II** (Prereq. 11.200) 4 Cl.; 4 Q.H.
Central force field motion; scattering; kinematics and dynamics of a system of particles; conservation theorems; rigid body motion; Hamilton's equations of motion.
Prof. Nath and Widom All Quarters
- 11.210 Electricity and Magnetism I** (Prereq. 11.154, 10.251) 3 Cl.; 3 Q.H.
Electrostatics using vector calculus; potential theory in two and three dimensions; dielectrics.
Prof. Von Goeler All Quarters
- 11.211 Electricity and Magnetism II** (Prereq. 11.210, 10.207) 4 Cl.; 4 Q.H.
Magnetostatics; magnetic materials; time-dependent circuits.
Prof. Vaughn Fall and Winter Qtrs.
- 11.212 Electricity and Magnetism III** (Prereq. 11.211) 4 Cl.; 4 Q.H.
Maxwell's equations; electromagnetic waves; interaction of charges and fields.
Prof. Vaughn Spring Qtr.
- 11.220 Thermodynamics and Kinetic Theory** (Prereq. 11.154, 10.205) 4 Cl.; 4 Q.H.
Simple thermodynamic systems; basic concepts and postulates, entropy; equilibrium; reversibility and irreversibility; thermodynamic potentials; phase changes; application to various physical systems; elementary kinetic theory of molecules; Maxwell's distribution; transport processes.
Prof. Gottschalk All Quarters
- 11.230 Modern Physics** (Prereq. 10.205, 11.154) 4 Cl.; 4 Q.H.
A review of experiments demonstrating the atomic nature of matter, properties of the electron, the nuclear atom; the breakdown of classical laws; quantization of light energy and atomic excitation energy; the radiation paradox of atomic structure; the wave nature of matter; the Bohr-Sommerfeld atomic theory; the hydrogen spectrum; the periodic table; characteristic X-rays.
To be Announced All Quarters
- 11.240 Quantum I** (Prereq. 11.230, 10.207) 4 Cl.; 4 Q.H.
Observations of macroscopic and microscopic bodies; the uncertainty principle; wave-particle duality; probability and probability amplitudes; Schrodinger wave theory; one-dimensional problems.
Prof. Wu and Von Goeler Fall and Winter Qtrs.
- 11.241 Quantum II** (Prereq. 11.240) 4 Cl.; 4 Q.H.
Discrete and continuous states; Schrodinger equation in 3 dimensions; angular momentum; general theory of quantum mechanics; applications.
Prof. Wu Spring Qtr.
- 11.260 Wave Laboratory** (Prereq. 11.154) 2 Cl.; 3 Lab.; 4 Q.H.
A general treatment of the problems of mechanical and electromagnetic radiation as wave phenomena; the differential wave equation and its applica-

tion to selected topics; interference and diffraction theory from the standpoint of the Huygen's-Fresnel and Kirchoff formulations; selected experiments in acoustics, optics and microwaves to illustrate these problems.

Prof. Grojean

Fall and Winter Qtrs.

- 11.261 Experimental Laboratory** (Prereq. 11.154, 11.170) 1 Cl.; 4 Lab.; 3 Q.H.
Atomic nature of matter, properties of the electron; relativity; vacuum systems; machine shop practice.

Prof. Neighbor

All Quarters

- 11.262 Electronics Laboratory** (Prereq. 11.261) 1 Cl.; 4 Lab.; 3 Q.H.
Electronic circuits; pulse techniques; logic circuits; the photomultiplier; atomic detectors.

Prof. Neighbor

All Quarters

- 11.263 Modern Physics Laboratory** (Prereq. 11.262) 1 Cl.; 4 Lab.; 3 Q.H.
Compton effect; positron annihilation; the nuclear atom; atomic excitation by electrons; magnetic properties of the proton and electron; Zeeman effect; interaction of radiations and matter; Fermi levels in metal.

Prof. Neighbor

Fall and Winter Qtrs.

- 11.290, 11.291, 11.292, 11.295, 11.296, 11.297, 11.298, Honors Program**

All Quarters

Chemistry

- 12.101 General Chemistry** 2 Cl.; 3 Lab.; 3 Q.H.
Introduction to the principles of chemistry, with emphasis on stoichiometry, ionic solutions and the inorganic chemistry of biological systems.

Prof. Boig

Fall Qtr.

- 12.102 General Chemistry** (Prereq. 12.101) 2 Cl.; 3 Lab.; 3 Q.H.
Introduction to organic chemistry with emphasis on compounds of biological significance.

Prof. Boig

Winter Qtr.

- 12.111 General Chemistry** 3 Cl.; 3 Q.H.
For engineering students only. Atomic structure; chemical bonding; chemical calculations; states of matter; kinetic theory; chemical equilibrium.

Prof. Cass

Fall Qtr.

- 12.112 General Chemistry** (Prereq. 12.111) 3 Cl.; 3 Q.H.
For engineering students only. Solutions; acids and bases; ionic equilibrium; oxidation-reduction; the representative elements, especially the elements of the 2nd period; organic chemistry; nuclear chemistry.

Prof. Cass

Winter Qtr.

- 12.113 General Chemistry** (Prereq. 12.112) 3 Cl.; 3 Q.H.
For non-chemical engineering students only. Electrochemistry; equilibrium and spontaneous reactions; chemical kinetics; topics in inorganic chemistry.

Prof. Cass

Spring Qtr.

- 12.116 General Chemistry** (Prereq. 12.112) 3 Cl.; 3 Lab.; 4 Q.H.
For chemical engineering students only. Qualitative analysis; electrochemistry; equilibrium and spontaneous reactions; chemical kinetics; topics in inorganic chemistry.
Prof. Boig Spring and Summer Qtrs.
- 12.121 General Chemistry** 3 Cl.; 3 Lab.; 4 Q.H.
For non-chemistry majors only. Atomic structure and periodicity; chemical bonding; stoichiometry; solutions; states of matter; chemical equilibrium; laboratory experiments illustrating above principles.
Staff Fall Qtr.
- 12.122 General Chemistry** (Prereq. 12.121) 3 Cl.; 3 Lab.; 4 Q.H.
For non-chemistry majors only. Acids and bases; ionic equilibrium; oxidation-reduction; chemistry of the representative elements; organic compounds; nuclear chemistry.
Staff Winter Qtr.
- 12.123 General Chemistry** (Prereq. 12.122) 3 Cl.; 3 Lab.; 4 Q.H.
For non-chemistry majors only. Introduction to qualitative analysis; electrochemistry; equilibrium and spontaneous reactions; chemical kinetics; topics in inorganic chemistry. Laboratory: the detection of metal ions in solution.
Staff Spring Qtr.
- 12.131 General Chemistry** 3 Cl.; 3 Lab.; 4 Q.H.
For chemistry majors and selected biology majors. Stoichiometry; atomic structure; chemical bonding; solutions; states of matter; chemical equilibrium; acids and bases. Laboratory: introduction to quantitative analysis.
Prof. Shepard Fall Qtr.
- 12.132 General Chemistry** (Prereq. 12.131) 3 Cl.; 3 Lab.; 4 Q.H.
For chemistry majors and selected biology majors. Solutions of electrolytes; ionic equilibrium; oxidation-reduction; electrochemistry; equilibrium and spontaneous reactions; chemistry of the representative elements. Laboratory: quantitative analysis.
Prof. Shepard Winter Qtr.
- 12.133 General Chemistry** (Prereq. 12.132) 3 Cl.; 6 Lab.; 5 Q.H.
For chemistry majors and selected biology majors. Principles of qualitative analysis; hydroxylic acids and their derivatives; chemical kinetics; related metals; coordination compounds; nuclear chemistry; introduction to organic chemistry. Laboratory: semimicro qualitative analysis.
Prof. Shepard Spring and Summer Qtrs.
- 12.135 General Chemistry** 3 Cl.; 3 Lab.; 4 Q.H.
Atomic structure; chemical bonding; states of matter; solutions; chemical equilibrium; electrolytes; electrochemistry; ionic equilibrium. Laboratory experiments illustrating these principles.
Prof. Spinos Fall and Winter Qtrs.

- 12.136 General Chemistry** (Prereq. 12.135) 3 Cl.; 3 Lab.; 4 Q.H.
Nuclear chemistry; periodic properties of the representative elements; related metals; coordination compounds; introduction to organic structures; introduction to chemical analysis. Laboratory experiments illustrating these principles.
Prof. Spinos Spring and Summer Qtrs.
- 12.141 Organic Chemistry** (Prereq. 12.123 or 12.133 or 12.136) 3 Cl.; 3 Lab.; 4 Q.H.
Molecular structure; nomenclature; properties; reactions of aliphatic, alicyclic, and aromatic hydrocarbons.
Prof. Howell and Staff Fall and Winter Qtrs.
- 12.142 Organic Chemistry** (Prereq. 12.141) 3 Cl.; 3 Lab.; 4 Q.H.
Monofunctional compounds; nomenclature, preparation, properties, and reactions of alcohols, halides, ethers, aldehydes, ketones, amines and carboxylic acids and their derivatives, with some attention to biological significance.
Prof. Howell and Staff Spring and Summer Qtrs.
- 12.143 Organic Chemistry** (Prereq. 12.142) 3 Cl.; 3 Lab.; 4 Q.H.
Polyfunctional compounds; glycols, substituted acids, carbohydrates, amino acids, proteins, and heterocyclic compounds; with special emphasis on biological significance.
Prof. Howell and Staff Fall and Winter Qtrs.
- 12.147 Organic Chemistry** (Prereq. 12.116) 4 Cl.; 3 Lab.; 5 Q.H.
Aliphatic compounds; preparation, properties, and reactions of the more common classes of open-chain compounds; electronic interpretation of structures and reactions; petrochemicals; synthetic resins; carbohydrates; fats; proteins.
Prof. Zuffanti Fall and Winter Qtrs.
- 12.148 Organic Chemistry** (Prereq. 12.147) 4 Cl.; 3 Lab.; 5 Q.H.
Aromatic compounds: preparation, properties, and reactions of the more common classes of aromatic compounds; electronic interpretation of structures and reactions of aromatic compounds; dyes, commercial solvents, and important industrial products. A brief introduction to alicyclic and heterocyclic compounds.
Prof. Zuffanti Spring and Summer Qtrs.
- 12.153 Organic Chemistry** (Prereq. 12.133) 3 Cl.; 3 Lab.; 4 Q.H.
Syntheses and properties of aliphatic and aromatic hydrocarbons and their functional derivatives; correlation between the structure of organic compounds and their physical and chemical properties; electronic interpretation of organic reactions.
Prof. Viola Fall and Winter Qtrs.
- 12.154 Organic Chemistry** (Prereq. 12.153) 3 Cl.; 3 Lab.; 4 Q.H.
Continuation of 12.153.
Prof. Viola Spring and Summer Qtrs.

- 12.155 Organic Chemistry** (Prereq. 12.154) 3 Cl.; 6 Lab.; 5 Q.H.
Continuation of 12.154.
Prof. Holton Fall and Winter Qtrs.
- 12.161 Physical Chemistry** (Prereq. 12.148 or 12.154); 4 Cl.; 3 Lab.; 5 Q.H.
Chemical thermodynamics; first and second laws; phase equilibria; solutions.
Prof. Luder and Gressler Spring and Summer Qtrs.
- 12.162 Physical Chemistry** (Prereq. 12.161) 4 Cl.; 3 Lab.; 5 Q.H.
Kinetic theory of gases; chemical kinetics; electrochemistry: conductance and ionic reactions, electrochemical cells.
Prof. Luder and Gressler Spring and Summer Qtrs.
- 12.163 Physical Chemistry** (Prereq. 12.162) 3 Cl.; 3 Lab.; 4 Q.H.
Quantum chemistry: particles and waves; Schroedinger wave mechanics; the chemical bond.
Prof. Roebber Fall and Winter Qtrs.
- 12.171 Analytical Chemistry** (Prereq. 12.143) 3 Cl.; 3 Lab.; 4 Q.H.
The principles and practice of inorganic quantitative analysis and the applications of gravimetric and volumetric methods of analysis. Laboratory analyses of samples.
Prof. Spinos Fall and Winter Qtrs.
- 12.174 Analytical Chemistry** (Prereq. 12.143) 4 Cl.; 4 Lab.; 5 Q.H.
The principles and practice of inorganic quantitative analysis; solution calculations and interpretation of results; the theory and application of volumetric and gravimetric methods of analysis. Laboratory analyses of samples.
Prof. Spinos Spring and Summer Qtrs.
- 12.176 Analytical Chemistry** (Prereq. 12.161) 4 Cl.; 4 Q.H.
Fundamental principles of classical analytical chemistry; the theory of modern applications of gravimetric and volumetric methods of analysis.
Prof. Jankowski Spring and Summer Qtrs.
- 12.177 Analytical Chemistry** (Prereq. 12.176) 3 Cl.; 6 Lab.; 5 Q.H.
The principles and practice of instrumental methods of analysis. Laboratory analysis of samples.
Prof. Jankowski Fall and Winter Qtrs.
- 12.178 Analytical Chemistry** (Prereq. 12.177) 1 Cl.; 6 Lab.; 3 Q.H.
Interpretation of analytical results. Laboratory analysis of samples.
Prof. Jankowski Spring and Summer Qtrs.
- 12.182 Chemical Literature** (Prereq. 12.163) 2 Cl.; 2 Q.H.
Uses of abstracting journals; types and sources of publications; patents as sources of information; sources of financial, statistical, and industrial information. Preparation of a detailed bibliography on an original topic. Preparation of written progress reports, typical research reports, etc.
Staff Spring and Summer Qtrs.

- 12.184 Biochemistry** (Prereq. 12.143 or 12.148 or 12.155) 4 Cl.; 4 Q.H.
The cell and its constituents; the properties of enzymes and the nature of the catalytic process; metabolism of carbohydrates, fats, and proteins.
Staff Spring Qtr.
- 12.211 Advanced Inorganic Chemistry** (Prereq. 12.163) 2 Cl.; 2 Q.H.
Advanced treatment of the chemistry of transition metals; acid and base behavior; the significance of nuclear properties; nuclear changes and tracer studies in inorganic chemistry.
Prof. Des Marteau Fall and Winter Qtrs.
- 12.212 Advanced Inorganic Chemistry** (Prereq. 12.211) 2 Cl.; 2 Q.H.
Characteristics of atoms and molecules based on their electronic structure and the periodic classification of elements; structure of crystals; electrostatic complexes; advanced chemistry of lighter elements.
Prof. Des Marteau Spring Qtr.
- 12.251 Advanced Organic Chemistry** (Prereq. 12.155) 4 Cl.; 4 Q.H.
Nomenclature of organic compounds; synthetic resins; directional enolization; acidic and basic catalyzed reaction mechanisms; scope of the Diels-Alder diene synthesis; terpenes; heterocyclic chemistry.
Prof. Zuffanti Fall and Winter Qtrs.
- 12.253 Identification of Organic Compounds** (Prereq. 12.155) 1 Cl.; 6 Lab.; 3 Q.H.
Qualitative analysis of organic compounds having one or two functional groups. Single liquids, single solids, liquid mixtures, solid mixtures, and some industrial products are analyzed.
Prof. Zuffanti Fall and Winter Qtrs.
- 12.261 Advanced Physical Chemistry** (Prereq. 12.163) 4 Cl.; 4 Q.H.
Molecular structure and spectra; introduction to statistical thermodynamics; states of matter.
Prof. Wiener Fall and Winter Qtrs.
- 12.281 Senior Research** (Prereq. 12.178 and 12.182) 9 Lab.; 3 Q.H.
Original experimental work under direction of a staff member. Approval of department head necessary.
Staff Fall and Winter Qtrs.
- 12.282 Senior Research** (Prereq. 12.281) 6 Lab.; 2 Q.H.
Continuation of 12.281, culminating in a research report on the year's work.
Staff Spring Qtr.
- 12.284 Advanced Chemical Synthesis** (Prereq. 12.155) 9 Lab.; 3 Q.H.
Special projects in the synthesis of organic and/or inorganic compounds, using advanced techniques.
Staff Spring Qtr.

12.286 Advanced Chemical Measurements

(Prereq. 12.163 and 12.178) 9 Lab.; 3 Q.H.

Laboratory problems in analytical and/or physical chemistry.

Staff

Spring Qtr.

12.288 Special Topics

(Prereq. 12.163) 4 Cl.; 4 Q.H.

Staff

Spring Qtr.

12.192, 12.292, 12.293, 12.294 Honors Program

(each) 4 Q.H.

All Quarters

Earth Sciences

16.106 Introduction to Earth Science I

3 Cl.; 3 Q.H.

The geological characteristics of the immediate environment are elaborated upon, until an extensive classified list reveals the fundamental forces and factors causing topographical change. Several of these factors are examined in detail. Two major interpretations of these changes result: 1) the probable internal structure of the earth; 2) their significance for the age of the earth and its historical development.

Prof. Overcash and Staff

Fall Qtr.

16.107 Introduction to Earth Science II

3 Cl.; 3 Q.H.

The characteristics of the ocean as a special topographical feature leads to a study of the physical and biological significance of this realm of our total environment.

The common factor of the atmosphere and its interrelationships to the surface of the earth are established. Weather phenomena and climate patterns complete the study of our earth as a body in space.

Prof. Overcash and Staff

Winter Qtr.

16.108 Introduction to Earth Science III

3 Cl.; 3 Q.H.

The earth serves as a point from which observations can be made of the entire universe. The common illusionary behaviors are examined to determine the heliocentric organization and resultant behaviors of our earth, the accompanying solar system components, and their relationship to the stellar background.

An analysis of the Milky Way galaxy provides a basis for the introduction of theories of cosmology. The realistic probabilities of human space exploration are considered.

Prof. Overcash and Staff

Spring Qtr.

16.111 Earth Sciences I

4 Cl.; 4 Q.H.

Not open to students who have taken 16.106, 16.107, or 16.108. An introduction to the geological and oceanological characteristics of the earth. Topographical features are identified; the forces that produce change are examined and the interrelationships are analyzed. Practical applications and field experience are employed whenever feasible.

Mr. Harty

Fall and Winter Qtrs.

16.112 Earth Sciences II

4 Cl.; 4 Q.H.

Not open to students who have taken 16.106, 16.107, or 16.108. The features and forces of weather and climate are studied with emphasis on their immediate significance to an individual devoted to extensive out-of-door activities. Weather signs, weather patterns and forecasting are of primary concern. The earth as a body in space is related to the remainder of the universe. Field observations and interpretations are made of the earth-universe relationships. The particular behaviors of the solar system components are identified. The celestial features are discussed to establish a conceptual image of the Milky Way galaxy. Stellar evolution and its significance for cosmology serves to unify the study of the earth in space.

Mr. Harty

Spring and Summer Qtrs.

16.121 Introduction to Natural History I

4 Cl.; 4 Q.H.

The identifying characteristics, life history, ecological relationships and economic importance of the invertebrates, amphibians and reptiles; special attention to the animals and plants found in the tidal zone along the coast; rocks and minerals common to the New England area.

Prof. Overcash and Kochanczyk

Fall and Summer Qtrs.

16.122 Introduction to Natural History II

4 Cl.; 4 Q.H.

A brief study of fish, birds, and mammals completes the animal kingdom. The algae, fungi, mosses, ferns and higher plants are treated in the same manner as were the animals.

Prof. Overcash

Winter and Spring Qtrs.

16.125 Conservation of Natural Resources

4 Cl.; 4 Q.H.

Problems relating to the use and preservation of the resources of water, soil, forests and wildlife; non-renewable mineral resources, particularly the mineral fuels.

Prof. Overcash and Staff

Fall and Winter Qtrs.

16.131 Oceanography I

4 Cl.; 4 Q.H.

An introduction to the geology of the ocean basins, and the physical and chemical properties of sea water; the development of ocean currents and the important effects these currents have on the land masses of the world.

Prof. Gordon

Fall Qtr.

16.132 Oceanography II

4 Cl.; 4 Q.H.

Animal and plant life in the various zones of the ocean; the growing economic importance of the oceans as a source of food for the expanding world population.

Prof. Gordon

Winter and Spring Qtrs.

16.135 Geology of New England

(Prereq. 16.106 or 16.141) 4 Cl.; 4 Q.H.

A systematic study of significant topographic features of New England and the geological forces and processes involved in their formation. Included for study will be the Boston Basin, the Connecticut River Valley, New England coastal features, the White and Green Mountains.

Prof. Ruggles

Spring and Summer Qtrs.

16.141 Principles of Geology

4 Cl.; 4 Q.H.

An introduction to the kinds of evidence on which our present understanding of geology is based. While some consideration will be given to rock classification and landscape morphology, this will be subordinate to a consideration of the physical and chemical forces which interact to form and shape the earth.

Miss Morgenstern

Fall and Winter Qtrs.

16.142 Historical Geology

4 Cl.; 4 Q.H.

The factors that serve the geologist in determining the history of a land mass, and the extent to which these factors have been and can be applied in the field; Eras and Periods currently identified with specific reference to the environment that characterized the times, and the forces that provoked the development, persistence, and termination of each time unit.

Miss Morgenstern

Spring and Summer Qtrs.

16.143 Geomorphology

(Prereq. 16.106 or 16.141) 4 Cl.; 4 Q.H.

The structural development and alteration of the earth's surface will be geologically considered. Such topics as weathering phenomena, erosion, stream and drainage development, groundwater and glaciation will be studied in some detail.

A term project will be required of each student. Lectures will be supplemented by laboratory exercises.

Mrs. Benjamins

Spring and Summer Qtrs.

16.144 Economic Geology

(Prereq. 16.106 or 16.141) 4 Cl.; 4 Q.H.

The structure, composition, occurrence and distribution of some of the more important minerals of economic value will be studied. Films and slides of particular mineral localities will supplement the lectures. Each student will select and investigate a classical mineral area to present in a paper.

Miss Morgenstern

Spring and Summer Qtrs.

16.151 History of Science and Technology I

4 Cl.; 4 Q.H.

Some of the major developments in science and technology from the time of prehistoric man to the period of the Renaissance; the origin and developments of tools, weapons, writing, mathematics, medicine and astronomy. Particular emphasis will be placed upon the interactions between science, technology and society.

Prof. Wilmarth

Fall and Winter Qtrs.

16.152 History of Science and Technology II

4 Cl.; 4 Q.H.

The history of some of the major developments in science and technology from the time of the Renaissance to the present; special emphasis on the origin and development of the Newtonian influence; the limitations of the techniques of the 17th, 18th and 19th centuries as evidenced in contemporary society; the potentials for scientific and technological advancement.

Prof. Wilmarth

Spring and Summer Qtrs.

16.161 Observational Astronomy

4 Cl.; 4 Q.H.

An introduction to the night sky as seen by the naked eye and with simple optical aids. The location and identification of constellations, major stars, planets, comets and meteors. Three telescopic viewing sessions will be held.
 Profs. Overcash and Wilmarth
 Spring and Summer Qtrs.

16.162 Astronomy

4 Cl.; 4 Q.H.

The principles and practices of modern astronomy are introduced through consideration of the solar system, Milky Way Galaxy, and the universe. This is done by study of the observational devices and data and their significance to cosmology.
 Mr. McClennen
 Fall and Winter Qtrs.

16.170 Engineering Geology

(Prereq. 10.142) 4 Cl.; 4 Q.H.

Origin and composition of earth's crust — soil, rocks, clay and rock mineralogy, weathering, stream and shoreline problems, glaciers, earth movements, elements of hydrologic cycle, geological mapping and exploration.
 Prof. Ruggles
 Fall and Winter Qtrs.

16.174 Geology

2 Cl.; 2 Q.H.

For Part-Time Civil Engineering Program. Origin and composition of earth's crust — soil, rocks, clay and rock materials; weathering, stream and shoreline problems.
 To be announced
 Fall Qtr.

16.175 Geology

(Prereq. 1.174) 2 Cl.; 2 Q.H.

For Part-Time Civil Engineering Program. Glaciers, earth movements, elements of Hydrologic cycle, geological mapping and exploration.
 To be announced
 Winter Qtr.

16.180 Physical Geography

4 Cl.; 4 Q.H.

Constructed to bring an understanding of man's physical environment with concentration of study upon climates, landforms, surface waters, soils, and vegetation.
 Mr. Lawson
 Fall and Winter Qtrs.

16.181 Historical Geography

4 Cl.; 4 Q.H.

Methods and approaches toward the study of historical-cultural processes. Emphasis will be devoted to the environmental conditions of the evolution of man; the origin and dispersal of agriculture; man's historical role in altering his environment; and the environmental influences on the origin and diffusion of urbanization.
 Mr. Lawson
 Fall and Winter Qtrs.

16.185 Climatology I

4 Cl.; 4 Q.H.

The systematic aspects of climatology emphasizing the analysis of meteorological elements and controls of weather. World distributions of individual weather processes are also studied.
 Mr. Lawson
 Spring and Summer Qtrs.

16.186 Climatology II

(Prereq. 16.185) 4 Cl.; 4 Q.H.

The individual elements of climate are synthesized into climatic types and regions. Climatic classifications are employed as vehicles for describing the distribution of climates. Microclimatology and applied climatology and human dimensions of weather modification are introduced.

Mr. Lawson

Spring and Summer Qtrs.

Biology

18.101 Elements of Biology

2 Cl.; 3 Lab.; 3 Q.H.

Basic principles of biology with emphasis upon animal biology.

Prof. Morse

Fall Qtr.

18.102 Elements of Biology

(Prereq. 18.101) 2 Cl.; 3 Lab.; 3 Q.H.

Continuation of 18.101.

Prof. Morse

Winter Qtr.

18.103 Introduction to Physiology

3 Cl.; 3 Lab.; 4 Q.H.

Non-biochemical physiology stressing function of animal systems.

Prof. Werntz

Winter Qtr.

18.104 Physiology

2 Cl.; 3 Lab.; 3 Q.H.

Principles of physiology.

Prof. Shukri

Winter Qtr.

18.105 Physiology

(Prereq. 18.104) 2 Cl.; 3 Lab.; 3 Q.H.

Principles of physiology.

Prof. Shukri

Spring Qtr.

18.107 Integrated Science

4 Cl.; 3 Lab.; 4 Q.H.

Principles of chemistry; principles of biology.

Mr. Curtis

Fall Qtr.

18.108 Integrated Science

(Prereq. 18.107) 4 Cl.; 3 Lab.; 4 Q.H.

Human anatomy and physiology.

Mr. Curtis

Winter Qtr.

18.109 Integrated Science

(Prereq. 18.108) 4 Cl.; 3 Lab.; 4 Q.H.

Biology of micro-organisms; medical bacteriology including epidemiology; human parasitology.

Mr. Curtis

Spring and Summer Qtrs.

18.110 Microbiology

2 Cl.; 3 Lab.; 3 Q.H.

Principles of bacteriology; medical microbiology and epidemiology.

Prof. Gainor

Spring Qtr.

18.111 General Biology

2 Cl.; 3 Lab.; 3 Q.H.

Introduction to essential concepts in the major areas of biology; physico-chemical background of biology; cell doctrine; analysis of structure, function and development in vertebrate animals.

Prof. Werntz

Fall Qtr.

- 18.112 General Biology** (Prereq. 18.111) 2 Cl.; 3 Lab.; 3 Q.H.
 Analysis of structure, function and development in vascular plants; intra-cellular processes; diversity and adaptation in animals.
 Prof. Werntz Winter Qtr.
- 18.113 General Biology** (Prereq. 18.112) 2 Cl.; 3 Lab.; 3 Q.H.
 Diversity and adaptation in plants; organisms in their environment; heredity; history and mechanism of evolution.
 Prof. Werntz Spring and Summer Qtrs.
- 18.116 Clinical Pathology** (Prereq. 18.113) 9 Cl.; 18 Lab.; 4 Q.H.
 Introduction to the methods, principles, and theories in clinical pathology and clinical research.
 Prof. Karlsson Spring and Summer Qtrs.
- 18.118 Organic Evolution** 4 Cl.; 4 Q.H.
 The major features of organic evolution with emphasis on vertebrate evolution, genetics, and physical influences.
 Prof. Moyer Fall Qtr.
- 18.120 Basic Microbiology** 3 Cl.; 4 Lab.; 4 Q.H.
 Microbial life, emphasizing morphological characteristics, physiological activities and disease production.
 Dr. Blanchard Fall and Winter Qtrs.
- 18.125 Human Physiology** (Prereq. 18.129 or equiv.) 2 Cl.; 3 Lab.; 3 Q.H.
 Physical and biochemical activities of the cell; functions of blood and the circulatory systems; osmoregulation.
 To be announced Fall Qtr.
- 18.126 Human Physiology** (Prereq. 18.125) 2 Cl.; 3 Lab.; 3 Q.H.
 Nerve and muscle function; digestion, respiration, internal secretion, and the physiology of sex and reproduction.
 To be announced Spring and Summer Qtrs.
- 18.127 Basic Animal Biology** 2 Cl.; 3 Lab.; 3 Q.H.
 Principles of biology and life as exemplified by the cell and protoplasm.
 To be announced Fall Qtr.
- 18.128 Basic Animal Biology** (Prereq. 18.127) 2 Cl.; 3 Lab.; 3 Q.H.
 Organ systems and their functions.
 To be announced Winter Qtr.
- 18.129 Basic Animal Biology** (Prereq. 18.128) 2 Cl.; 3 Lab.; 3 Q.H.
 Embryology, genetics, and evolution of animals.
 To be announced Spring Qtr.
- 18.130 Basic Botany** 3 Cl.; 6 Lab.; 5 Q.H.
 Major systematics, morphology, life histories, and physiology of the kingdom plantae.
 Profs. Khudairi and Barkley Fall and Winter Qtrs.

- 18.131 Introduction to Plant Physiology** 3 Cl.; 3 Lab.; 4 Q.H.
Physiological processes in plants at the cellular and organ levels including water relations, mineral nutrition, photosynthesis, respiration protein and fat synthesis, growth, plant hormones, and development.
Prof. Khudairi Spring Qtr.
- 18.140 Haematology** 3 Cl.; 3 Lab.; 4 Q.H.
The normal and pathologic morphology of the blood and blood-forming organs with emphasis on diagnosis and prognosis.
Prof. Karlsson Fall and Winter Qtrs.
- 18.148 Human Anatomy** 3 Cl.; 3 Lab.; 4 Q.H.
The structure and development of the human body.
Prof. Shukri All Qtrs.
- 18.150 Comparative Vertebrate Anatomy** (Prereq. 18.113) 3 Cl.; 6 Lab.; 5 Q.H.
Morphology and phylogeny of the vertebrates; laboratory studies on taxonomy of the group, and specific morphology of the dogfish shark and the cat.
Prof. Ahlberg Fall and Winter Qtrs.
- 18.155 Developmental Anatomy** (Prereq. 18.150) 3 Cl.; 6 Lab.; 5 Q.H.
Emphasizes chick and pig in the laboratory.
Prof. Ahlberg Spring and Summer Qtrs.
- 18.158 Vertebrate Physiology** (Prereq. General Chem.) 3 Cl.; 3 Lab.; 4 Q.H.
Properties of living protoplasm; the general organization and function of cells; translocation of materials and the organization of animals; the physiology of the skeletal systems of man and animals; the physiology of amoeboid, ciliary and contractile movement with emphasis on muscle metabolism; the structure and function of neurons, reflex arcs, the autonomic nervous system, and the sensory receptors.
Prof. Pearincott Fall and Winter Qtrs.
- 18.159 Vertebrate Physiology** (Prereq. 18.158) 3 Cl.; 3 Lab.; 4 Q.H.
Fluid media of animals, emphasizing water and electrolyte balance and kidney function in many; the physiology of blood, including its formation, functions, clotting, antigens and tests for identifying blood; the physiology of the heart, nervous control of the vascular system, breathing and gas transport, heat regulation, nutrition, digestion and assimilation; the endocrine secretions and the physiologic aspects of reproduction.
Prof. Pearincott Spring and Summer Qtrs.
- 18.200 Genetics** (Prereq. 18.113) 3 Cl.; 3 Lab.; 4 Q.H.
Fundamental principles of genetics.
Prof. Moyer Spring and Summer Qtrs.
- 18.210 Invertebrate Zoology** (Prereq. 18.113) 3 Cl.; 6 Lab.; 5 Q.H.
The invertebrate animals exclusive of the protozoans and insects.
Prof. Morse Fall and Winter Qtrs.

- 18.225 Animal Histology** (Prereq. 18.150) 2 Cl.; 3 Lab.; 3 Q.H.
Microscopic study of fundamental types of animal tissues.
Prof. Pearincott Spring and Summer Qtrs.
- 18.226 Animal Histology** (Prereq. 18.225) 2 Cl.; 3 Lab.; 3 Q.H.
Continuation of 18.225. Microscopic anatomy of animal organs, primarily mammalian organs.
Prof. Pearincott Fall Qtr.
- 18.228 Histological Technique** (Prereq. 18.150) 1 Cl.; 6 Lab.; 3 Q.H.
General methods of tissue preparation for purposes of microscopic study; preparation of solutions and stains; the microtome and its operation together with specific directions for fixation, clearing, hardening, embedding, section-cutting, and staining of tissues.
Profs. Riser and Morse Winter and Spring Qtrs.
- 18.240 Microbial Physiology** (Prereq. 18.120) 3 Cl.; 4 Lab.; 5 Q.H.
The biochemical changes brought about through microbial activities; measurement of metabolic biosynthesis and degradation, rates of reaction and determination of end products.
Prof. Rosenberg Winter and Summer Qtrs.
- 18.258 Cellular and Comparative Physiology**
(Prereq. 18.150, 12.143) 3 Cl.; 3 Lab.; 4 Q.H.
Biophysics and biochemistry of the cells and tissues of animals including biogenesis, cell parts and their function, membranes and osmotic regulation, metabolism and photosynthesis, comparative nutrition and excretion, and enzyme action. Laboratory emphasizes modern instrumentation, experimental data accumulation and scientific report writing.
Prof. Goolsby Fall and Winter Qtrs.
- 18.259 Cellular and Comparative Physiology**
(Prereq. 18.258) 3 Cl.; 3 Lab.; 4 Q.H.
Nucleic acid and protein biosynthesis, information theory and coding; the physiology of collagen and bone; adaptive enzymes; form and function in muscles; amoeboid and ciliary movement; sensory and nervous electrophysiology.
Prof. Goolsby Spring Qtr.
- 18.290, 18.291 Directed Study** (Prereq. Compl. of Core Program) 2 Q.H.
Independent work on a chosen topic under direction of a faculty member. Limited to qualified juniors and seniors with approval of the department and special arrangements with the supervising faculty member.
All Qtrs.
- 18.295, 18.296, 18.297, 18.298 Honors Program** 4 Q.H.
All Qtrs.

Psychology

- 19.101 Introductory Psychology** 3 Cl.; 3 Q.H.
 Psychological principles.
 Prof. Warren and Staff Fall Qtr.
- 19.102 Basic Psychology** 4 Cl.; 4 Q.H.
 The basic principles of psychology.
 Prof. Warren and Staff Fall and Winter Qtrs.
- 19.103 Principles of Psychology I** 3 Cl.; 3 Q.H.
 The major fields of psychology; topics include maturation and growth, statistics, individual differences, and learning.
 Prof. Warren and Staff Fall and Winter Qtrs.
- 19.104 Principles of Psychology II** (Prereq. 19.103) 3 Cl.; 3 Q.H.
 Sensory bases of response, perception, motivation, emotions, and personality.
 Prof. Warren and Staff Spring and Summer Qtrs.
- 19.105 Foundations of Psychology I** 4 Cl.; 4 Q.H.
 Major concepts from most areas of psychological investigation; the experimental approach to the study of behavior including growth and development, individual differences, learning and social psychology.
 Prof. Warren and Staff Fall and Winter Qtrs.
- 19.106 Foundations of Psychology II** (Prereq. 19.105) 4 Cl.; 4 Q.H.
 The sensory bases of response, perception, motivation, emotions, personality, and behavioral disorders.
 Prof. Warren and Staff Spring and Summer Qtrs.
- 19.107 General Psychology I** 3 Cl.; 2 Lab.; 4 Q.H.
 Major concepts from most areas of psychological investigation. The experimental approach to the study of behavior including growth and development, individual differences, learning, and social psychology.
 Prof. Warren and Staff Fall and Winter Qtrs.
- 19.108 General Psychology II** (Prereq. 19.107) 3 Cl.; 2 Lab.; 4 Q.H.
 The sensory bases of response, perception, motivation, emotions, personality, and behavioral disorders.
 Prof. Warren and Staff Spring and Summer Qtrs.
- 19.120 Statistics in Psychology I** (Prereq. 19.106) 4 Cl.; 4 Q.H.
 Measures of central tendency, variability, graphic presentation of data, standard scores, reliability and regression.
 Profs. Arees, Schick Fall and Winter Qtrs.
- 19.121 Statistics in Psychology II** (Prereq. 19.120) 4 Cl.; 4 Q.H.
 Probability; binomial and normal distributions; parametric and non-parametric tests of significance, including chi square, t-test, F-test, sign test; and introduction to analysis of variance.
 Profs. Arees, Schick Spring and Summer Qtrs.

19.122 Basic Statistics

5 Cl.; 5 Q.H.

Descriptive statistics including central tendency, variability, normal distribution, linear regression and correlation. Also tests of significance, t test, chi square and simple analysis of variance.

Prof. Arees, Schick

1970-71

19.130 Social Psychology

(Prereq. 19.106) 4 Cl.; 4 Q.H.

The analysis of the individual's behavior in social contexts; topics considered include the historical development of social psychology, socialization, national character, ethnic and class structure, prejudice, attitudes and attitude measurement, propaganda, crowd behavior, group membership and structure, leadership, and social movements.

Prof. Lent

Spring and Summer Qtrs.

19.135 Personality

(Prereq. 19.106) 4 Cl.; 4 Q.H.

Systematic study of the normal personality; a number of approaches to personality research including the Freudian, neo-Freudian, Lewinian, stimulus-response, factor analytic, and constitutional.

Profs. Brightbill, Lent

Spring and Summer Qtrs.

19.140 Child and Adolescent Psychology

(Prereq. 19.106 or 19.108 or 19.102) 4 Cl.; 4 Q.H.

Exploration of the processes of growth and development from infancy through adolescence; developmental theories of Piaget and Erikson; genetics; maturation; intelligence; cognition; personality; language; social behavior; emotion; motivation learning.

Profs. Lent, Zamansky

Fall and Winter Qtrs.

19.141 Growth and Development I

4 Cl.; 4 Q.H.

Emphasis on infancy and childhood. Fundamental processes of growth and development from conception to the beginning of adolescence; physical development and maturation; socialization; social and interpersonal relations; personality cognition; intelligence, emotion and motivation. Emphasis upon family setting as well as on the broader social environment.

Prof. Zamansky

Fall and Winter Qtrs.

19.142 Growth and Development II

4 Cl.; 4 Q.H.

Adolescence and adulthood. Exploration of physical and social changes in the years from adolescence to senescence. Consideration of special circumstances and problems associated with adult life.

Prof. Zamansky

Spring and Summer Qtrs.

19.146 Motivation

(Prereq. 19.106 or 19.108) 4 Cl.; 4 Q.H.

The various aspects of motivation; primary and secondary drives; unconscious motivation; effectance motivation; the assessment of motives.

Prof. Zamansky

Spring and Summer Qtrs.

19.150 Perception

(Prereq. 19.106 or 19.108) 4 Cl.; 4 Q.H.

An introduction to the nature of the perceptual world; the nature of object recognition and identification, spatial organization, contextual effects, learning and perception, and the influence of attitudinal, motivational, and personality factors on perception.

Prof. Schissler

Spring and Summer Qtrs.

19.155 Psychology of Language and Thought

(Prereq. 19.106 or 19.108) 4 Cl.; 4 Q.H.

Recent research in psycholinguistics and cognitive psychology will be reviewed. Topics will include the acquisition of language, verbal habits, the measurement of meaning, cultural determinants of linguistic behavior, problem solving and creativity, and concept attainment.

Prof. Brightbill

Fall and Winter Qtrs.

19.160 Experimental Psychology I

(Prereq. 19.121) 3 Cl.; 3 Lab.; 4 Q.H.

Concentration upon the experimental method in the design, execution, analysis and reportings of psychological investigations. Laboratory experiments in the area of general experimental psychology.

Prof. Karis

Fall and Winter Qtrs.

19.161 Experimental Psychology II

(Prereq. 19.160) 3 Cl.; 3 Lab.; 4 Q.H.

A systematic analysis of methods in the investigation of basic animal and human learning processes; emphasis on experimental procedures, research findings, and theoretical interpretations; experiments on animal and human subjects.

Prof. Schissler

Spring and Summer Qtrs.

19.162 Experimental Psychology III

(Prereq. 19.161) 3 Cl.; 3 Lab.; 4 Q.H.

Structural and behavioral analysis of the sense organs; experimental methods, research findings and theoretical implications in the investigation of vision, audition, olfaction, gustation and the skin senses.

Prof. Karis

Fall and Winter Qtrs.

19.180 Physiological Psychology I

(Prereq. 19.108 or 19.106) 4 Cl.; 4 Q.H.

Evolution of the nervous system; neural transmission; neurophysiology of the reticular formation, cortex, motor systems, skin senses, vision and audition.

Prof. Samuels

Fall and Winter Qtrs.

19.181 Physiological Psychology II

(Prereq. 19.180) 4 Cl.; 4 Q.H.

Neural mechanisms of motivation and emotion, sleep, attention, perception, learning and memory.

Prof. Samuels

Fall Qtr.

19.201 Psychology of Abnormal Behavior

(Prereq. 19.140) 4 Cl.; 4 Q.H.

The symptomatology, etiology, dynamics, and therapy of the abnormal personality; the basic varieties of neurosis and psychosis; somatic therapies and fundamental varieties of psychotherapy.

Prof. Zamansky

All Qtrs.

19.202 Abnormal Psychology I

(Prereq. 2 yrs. psych.) 4 Cl.; 4 Q.H.

The abnormal personality; historical background; criteria of abnormality. Theoretical framework of normal and abnormal development; anxiety and defense; etiology, dynamics, and symptomatology of the neuroses.

Prof. Zamansky

Fall and Winter Qtrs.

- 19.203 Abnormal Psychology II** (Prereq. 19.202) 4 Cl.; 4 Q.H.
 Psychotherapy; etiology, dynamics, and symptomatology of the psychoses; psychosomatic, sociopathic, and organic disorders; somatic therapies; socio-cultural aspects.
 Prof. Zamansky Spring and Summer Qtrs.
- 19.210 History of Psychology** (Prereq. 2 yrs. psych.) 4 Cl.; 4 Q.H.
 Evaluation of modern psychology in the light of its historical origins.
 Prof. Warren Fall and Winter Qtrs.
- 19.211 Systems of Psychology** (Prereq. 19.210) 4 Cl.; 4 Q.H.
 Major schools of psychology which have influenced the development of modern psychology and contemporary systematic trends.
 Prof. Karis Spring and Summer Qtrs.
- 19.220 Psychological Testing** (Prereq. 19.120) 4 Cl.; 4 Q.H.
 Basic principles of test theory, test administration, and test construction; familiarization with representative types of tests.
 Prof. Lent Fall and Winter Qtrs.
- 19.240 Industrial Psychology** (Prereq. 19.106 or 19.108) 3 Cl.; 3 Q.H.
 Motivation of workers; employee attitudes and morale; industrial mental health; counseling; interviewing; personnel selection; psychological tests in industry; leadership; group decision methods; the optimal working environment.
 Profs. Pendleton, Nickerson All Qtrs.
- 19.295, 19.296, 19.297, 19.298 Honors Program** (each) 4 Q.H.
 All Qtrs.

Anthropology

- 20.100 Principles of Social Anthropology** 4 Cl.; 4 Q.H.
 An introduction to the general fields of anthropological investigations, its scope, and the nature of the integration of the subdisciplines in the concept of culture. Focus on concepts of social structure and organization, function, change, and evolutionary concepts of emerging levels of societal integration.
 Prof. Freilich All Qtrs.
- 20.110 Human Origins** (Prereq. 20.100, 20.103, or 50.103) 4 Cl.; 4 Q.H.
 The physical and cultural history of man from an evolutionary point of view, presenting primate background, physical and cultural development of the genus Homo, and riation. The time span is roughly a million years up to the Neolithic period about 10,000 years ago.
 Mr. Raymond Fall and Winter Qtrs.
- 20.111 Comparative Civilizations** (Prereq. 20.100, 20.103, or 50.103) 4 Cl.; 4 Q.H.
 Cultural development from the Neolithic period through the Early Bronze Age. Comparison will be made between the Near East and the distinctive

civilizations of the Far East, India, and Europe, and also with those of the New World. The dynamics of the development as well as substantive culture history will be stressed.

To be announced

Fall and Winter Qtrs.

20.120 Primitive Social and Political Organization

(Prereq. 20.100, 20.103, or 50.103) 4 Cl.; 4 Q.H.

The social structure and organization of the simpler band and tribal societies will be presented in a comparative framework; the emphasis is on ecology and functional integration under aboriginal conditions.

Prof. Singarimbun

Fall and Winter Qtrs.

20.150 New World Indian Ethnology

(Prereq. 20.100, 20.103, or 50.103) 4 Cl.; 4 Q.H.

The socio-political and ideological aspects of Amerindian societies before major acculturation, emphasizing the functional interrelations of cultural and social institutions.

Mr. Raymond

Spring and Summer Qtrs.

20.160 Middle Eastern Ethnology

(Prereq. 20.100, 20.103, or 50.103) 4 Cl.; 4 Q.H.

An areal approach considering pastoral, village, town, and city societies and their interrelations; the blending of various historical traditions and the local community as alternative and supplementary approaches.

Not offered 1968-69

20.170 Ethnology of Emerging Nations

(Prereq. 20.100, 20.103, or 50.103) 4 Cl.; 4 Q.H.

Aspects of the economic and political forces effective in transforming former colonial areas and traditional cultures into nations in Africa, the Near East, and SE Asia; the effects of this transformation on the social organization of local communities.

Not offered 1968-69

20.190 New World Archeology

(Prereq. 20.100, 20.103, or 50.103) 4 Cl.; 4 Q.H.

The archeological evidence of man in the New World from Palaeoindian times through the development of native American civilizations in Mexico and Peru. Cultural evolutionary hypotheses, with comparative data from the Old World, will provide the framework for viewing the New World developments.

Not offered 1968-69

20.220 Primitive Religion

(Prereq. 20.100, 20.103, or 50.103) 4 Cl.; 4 Q.H.

The interrelations of religious behavior and belief and other institutions of primitive societies; various sociological and anthropological theories on the origin of religious institutions and the significance of the religious experience in primitive society.

Prof. Weppner

Fall and Winter Qtrs.

- 20.240 Introduction to Field Methods** (Prereq. 21.240) 3 Cl.; 2 Lab.; 4 Q.H.
Theory and practice of methods of field research, with emphasis upon participant observation techniques, and the analysis of data. Students will take part in a field project.
Prof. Freilich Fall and Winter Qtrs.
- 20.250 Culture and Personality** (Prereq. 20.100, 20.103, or 50.103) 4 Cl.; 4 Q.H.
Theories, methods, and the substantive results of anthropological thought and research on the interrelations of human psychology, especially personality, society, and culture is presented with a view toward an integrated approach to the investigation of man.
To be announced Fall and Winter Qtrs.
- 20.260 Language and Culture** (Prereq. 20.100, 20.103, or 50.103) 4 Cl.; 4 Q.H.
Communication in non-human societies. The evolution of language. Structural linguistics. Language and thought. Relationships between cultural patterns and language. Recent developments in linguistic theory.
Prof. Singarimbun Spring and Summer Qtrs.
- 20.290 Directed Study** (Prereq. 20.120 and dept. approv.) 4 Q.H.
Independent work under the direction of members of the department upon a chosen topic. Limited to qualified seniors preparing in anthropology with approval of department.
Staff Fall and Winter Qtrs.
- 20.291 Directed Study** (Prereq. 20.120 and dept. approv.) 4 Q.H.
Staff Spring Qtr.
- 20.295, 20.296, 20.297, 20.298 Honors Program** (Prereq. 20.110 and dept. approv.) (each) 4 Q.H.
All Qtrs.

Sociology

- 21.100 Principles of Sociology** 4 Cl.; 4 Q.H.
The basis of human society, the process of individual adjustment to society and the matter of numbers, spatial distribution and organization of people. social organization, social institutions, personality development, and pre-institutional life.
Prof. Freilich All Qtrs.
- 21.102 Principles of Social Relations** 4 Cl.; 4 Q.H.
An introduction to the field of sociology emphasizing the concepts of culture, social organization, social institutions, personality development, and processes of social interaction. This course is offered mainly for Forsyth students.
Miss Lockeretz Spring Qtr.

21.111 American Society

(Prereq. 21.100, 21.102, 21.103, 21.108, or 50.103) 4 Cl.; 4 Q.H.

American society culture, and major social institutions: economic, religious, governmental, familial, educational, welfare, and recreational; social classes and stratification, mobility, and individualism.

Prof. Lee

Spring and Summer Qtrs.

21.120 Sociology of the Family

(Prereq. 21.100, 21.102, 21.103, 21.108 or 50.103) 4 Cl.; 4 Q.H.

The family as a social institution in several selected cultures; interrelations of the family and political, economic, and educational institutions; social nature of personality, role-taking, and the effects of individualism, mobility, and industrialism.

To be announced

Fall and Winter Qtrs.

21.130 Criminology

(Prereq. 21.111) 4 Cl.; 4 Q.H.

Patterns and evolution of criminal behavior, the social forces involved, and development of the individual criminal; administration of criminal justice: laws, courts, police, prisons.

Prof. Schafer

Fall and Winter Qtrs.

21.135 Juvenile Delinquency

(Prereq. 21.111) 4 Cl.; 4 Q.H.

The sociological and psychological approaches and their implications for a typology of delinquency; problems of prevention, treatment, and rehabilitation.

Prof. Schafer

Spring and Summer Qtrs.

21.137 Social Deviance

(Prereq. 21.100) 4 Cl.; 4 Q.H.

Analysis of various social problems, crime, juvenile delinquency, mental disorders, drug addiction, suicide, sexual behavior, poverty, war, and others.

Prof. Schafer

Spring Qtr.

21.140 Community Analysis (Prereq. 21.100, 21.108, or 50.103) 4 Cl.; 4 Q.H.

Relationship of man to his environment; development of the concept of community in relation to physical environment, member population and social institutions; community action programs.

Prof. Rubin

Spring Qtr.

21.145 Urban Society

(Prereq. 21.100, 21.102, 21.103, 21.108, or 50.103) 4 Cl.; 4 Q.H.

The foundations of city life in historical perspective; relationship of city life to environment, population, social organization, and cultural values; growth trends in American urban life.

Prof. Rubin

Spring and Summer Qtrs.

21.150 Race and Cultural Relations

(Prereq. 21.100, 21.102, 21.103, 21.108, or 50.103) 4 Cl.; 4 Q.H.

Racial nationalities and religious groups, particularly with reference to the United States; special emphasis on historical development, specific problems of adjustment and assimilation, and specific present-day problems and trends.

Not offered 1968-69

21.200 Seminar in Group Behavior I

(Prereq. 21.100, or consent of instr.) 4 Cl.; 4 Q.H.

Seminar focuses on: (1) small group theory; (2) the dynamics of group life; (3) individual behavior in the small group setting. Utilizes the seminar experience as a laboratory for learning, planning and experimentation.

Prof. Lee and Staff

Fall and Winter Qtrs.

21.201 Seminar in Group Behavior II

(Prereq. 21.200 or consent of instr.) 4 Cl.; 4 Q.H.

Usually continues course 21.200. Places heavier emphasis on providing opportunities for planning and execution of teaching and change projects.

Prof. Lee and Staff

Spring and Summer Qtrs.

21.210 Individual and Society

(Prereq. 21.100, 21.102, 21.103, 21.108, or 50.103) 4 Cl.; 4 Q.H.

The problem of adjustment confronting man in complex civilization; the theories of Freud, Sullivan, Horney, Erikson, Cooley, Mead, and Thomas regarding this problem.

Prof. Ferdinand

Fall and Winter Qtrs.

21.220 Introduction to Social Work

(Prereq. 21.111) 4 Cl.; 4 Q.H.

An orientation course planned to acquaint the student with the nature and scope of social work. After a brief survey of the history and early leadership of the movement, the course centers on the modern situation and current trends in the field. The work of both public and private welfare agencies; field trips to various types of social agencies in the metropolitan area.

To be announced

Fall and Winter Qtrs.

21.221 Practicum in Social Welfare

(Prereq. 21.220) 4 Cl.; 4 Q.H.

Discussion of problems in social welfare observed in the term between "Problems" and "Practicum." A research paper, based on directed field work in the intervening term, will be the major course requirement.

To be announced

Spring and Summer Qtrs.

21.239 Introduction to Statistical Analysis

3 Cl.; 2 Lab.; 4 Q.H.

Application to social data of the principles of measurement, probability, measures of centrality, tests of significance, and techniques of association and correlation.

To be announced

Fall and Winter Qtrs.

21.240 Research Methods I

(Prereq. 21.111) 3 Cl.; 2 Lab.; 4 Q.H.

An introduction to social research including survey techniques, design of research, interviewing, questionnaire construction, use of existing data, and content analysis. Students will take part in a survey.

Mr. Raymond

Fall and Winter Qtrs.

21.241 Research Methods II

(Prereq. 21.240) 3 Cl.; 2 Lab.; 4 Q.H.

Analysis of social data by means of coding, tabulating, and statistically interpreting information from surveys and other sources.

Mr. Raymond

Spring and Summer Qtrs.

21.260 Social Stratification

(Prereq. 21.100 21.102, 21.103, 21.108, or 50.103) 4 Cl.; 4 Q.H.

Theories of social inequality; concepts of social class; aspects of status and role differences; criteria for social mobility.

To be announced

Fall and Winter Qtrs.

21.270 Social Change

(Prereq. 21.100, 21.102, 21.103, 21.108, or 50.103) 4 Cl.; 4 Q.H.

Social and cultural dynamics with particular reference to the current contact situation occurring between industrialized and non-industrialized societies.

Profs. Coser, Krause

Spring and Summer Qtrs.

21.280 Social Theory I

(Prereq. 5 soc. anthro. courses or consent of instr.) 4 Cl.; 4 Q.H.

The development of sociology from the history of social thought. The emergence of several schools, beginning with Positivistic Organicism and Conflict Theory.

Profs. Rubin, Ferdinand

Fall and Winter Qtrs.

21.281 Social Theory II (Prereq. 21.280 and consent of instr.) 4 Cl.; 4 Q.H.

A seminar-lecture in which Formalism, Social Behaviorism, Social Action Theory, and Functionalism are studied critically.

Profs. Rubin and Ferdinand

Spring and Summer Qtrs.

21.290, 21.291 Directed Study

(Prereq. 21.111 and approv. of Dept. Chairman) (each) 4 Q.H.

Independent work under the direction of members of the department upon a chosen topic. Limited to qualified seniors preparing in sociology with approval of Department Chairman.

Staff

All Qtrs.

21.295, 21.296, 21.297, 21.298 Honors Program

(each) 4 Q.H.

Political Science

22.101 Introduction to Political Science I

3 Cl.; 3 Q.H.

The evolution of the modern state: Study of basic political concepts and forms of political organization.

Prof. Worth in charge

Fall Qtr.

22.102 Introduction to Political Science II

(Prereq. 22.101) 3 Cl.; 3 Q.H.

Constitutional and totalitarian systems: The development of operative liberty in Western democratic societies with special attention to the content of civil rights in the United States.

Prof. Worth in charge

Winter Qtr.

22.103 Introduction to Political Science II

(Prereq. 22.102) 3 Cl.; 3 Q.H.

A comparative analysis of the political process in congressional and parliamentary systems. Survey of international relations through an analysis of American foreign policy since World War II.

Prof. Worth in charge

Spring Qtr.

22.105 Principles of Political Science I

4 Cl.; 4 Q.H.

Democratic and totalitarian forms of government, the philosophies which underpin them, and the economic and social environment in which they function. Primarily for those students who have not taken the introductory course.

Prof. Grimes

Fall and Winter Qtrs.

22.106 Principles of Political Science II

(Prereq. 22.105) 4 Cl.; 4 Q.H.

Current international relations; the foreign policies of the major nation-states in the light of the East-West ideological conflict; the emergence of new nations in Africa and Asia; the necessity of preserving peace in the nuclear age.

Prof. Grimes

Spring and Summer Qtrs.

22.114 Political Issues

5 Cl.; 2½ Q.H.

Selected political topics based upon major issues, national and international. Primarily for Pharmacy majors.

Prof. Grimes

Summer Qtr.

22.131 American National Government (Prereq. 22.103 or 22.106) 4 Cl.; 4 Q.H.

An analysis of the structure and functions of American Government: The development of legislative policy and the nature of constitutional restraints on public power.

Prof. Worth

Spring and Summer Qtrs.

22.133 Political Parties and Pressure Groups (Prereq. 22.131) 4 Cl.; 4 Q.H.

Origin, growth, organization, and functions of pressure groups and political parties in the United States.

Prof. Cord

Spring and Summer Qtrs.

22.135 American Constitutional Law

(Prereq. 22.131) 4 Cl.; 4 Q.H.

Analysis of the changing attitudes of the Supreme Court in the areas of federalism, the national economy, foreign affairs, and judicial, congressional, and presidential power.

Prof. Cord

Fall and Winter Qtrs.

22.137 Civil Liberties in the United States (Prereq. 22.131) 4 Cl.; 4 Q.H.

Utilizing Supreme Court decisions and other reading materials, the constitutional guarantees of speech, press, religion, association, equal protection of laws, and the requirement of procedural due process will be examined.

Prof. Cord

Fall and Winter Qtrs.

22.141 Government and Politics in the States (Prereq. 22.131) 4 Cl.; 4 Q.H.

The structure, functions and politics of the states, analyzing their role in the federal system and their relationships with the national government and their component local governments.

Prof. Palmer

Fall and Winter Qtrs.

- 22.143 Urban and Metropolitan Government** (Prereq. 22.141) 4 Cl.; 4 Q.H.
The political, structural and functional problems of an urbanizing United States, including analyses of urban, suburban and metropolitan governmental systems and their roles in the federal system.
Prof. Palmer Spring and Summer Qtrs.
- 22.151 Comparative Government** (Prereq. 22.103 or 22.106) 4 Cl.; 4 Q.H.
European democratic and totalitarian forms of government. The United Kingdom, France, West Germany, and Soviet Russia.
Prof. Goldman Fall and Winter Qtrs.
- 22.171 Law and Society** 4 Cl.; 4 Q.H.
Introduction to the theory and philosophy of law; the historical foundations of the common law; legal methods. Primarily for Non-Political Science majors.
Prof. Bursey Spring and Summer Qtrs.
- 22.175 Current Political Issues** 4 Cl.; 4 Q.H.
An analysis of the constitutional and political background of selected contemporary public issues. Primarily for Non-Political Science majors.
Prof. Worth Fall and Winter Qtrs.
- 22.177 American Political Process** 4 Cl.; 4 Q.H.
This course is a general analysis of the American political system, including national, state and metropolitan governments and their interactions on each other. It is not open to political science majors or anyone who has taken 22.131 (American National Government).
Prof. Palmer Spring Qtr.
- 22.179 World Politics** 4 Cl.; 4 Q.H.
An analysis of the behavior of nations in international society, with emphasis on major current developments. Not open to political science majors or anyone who has taken 22.221 (International Relations).
Prof. Bursey Fall and Winter Qtrs.
- 22.221 International Relations** (Prereq. 22.103 or 22.106) 4 Cl.; 4 Q.H.
Elements and limitations of national power; contemporary world politics; problem of peace.
Prof. Worth Fall and Winter Qtrs.
- 22.223 American Foreign Policy** (Prereq. 22.103 or 22.106) 4 Cl.; 4 Q.H.
Formulation and conduct of foreign policy; role of the United States in politics since 1945.
Prof. Wilfong Spring Qtr.
- 22.224 The United States and the Far East** (Prereq. 22.103 or 22.106) 4 Cl.; 4 Q.H.
Relations of the United States with Far Eastern governments with emphasis upon Japan and China since 1945.
Prof. Jones Spring Qtr.

- 22.225 Soviet Government** 4 Cl.; 4 Q.H.
 A study of Soviet political origins and behavior with emphasis on recent changes in the party and state apparatus, the economy, and the administration of justice.
 Prof. Goldman Spring Qtr.
- 22.226 Soviet Foreign Policy** (Prereq. 22.103 or 22.106) 4 Cl.; 4 Q.H.
 The evolution of Soviet foreign policy since 1917 with emphasis on the development of the international Communist movement and the onset of the East-West ideological conflict.
 Prof. Goldman Fall Qtr.
- 22.227 Communism in Eastern Europe** (Prereq. 22.103 or 22.106) 4 Cl.; 4 Q.H.
 The communist governments of Eastern Europe with emphasis on their growing independence of Soviet Russia. Recent political change, economic liberalization, and new orientation in foreign policy.
 Prof. Goldman Spring Qtr.
- 22.228 Government and Politics in Africa** (Prereq. 22.103 or 22.106) 4 Cl.; 4 Q.H.
 The governmental systems, political parties, socio-economic problems and foreign policies of selected states north and south of the Sahara. U.S. and Sino-Soviet strategies in Africa.
 Prof. Goldman Fall Qtr.
- 22.231 International Organization** (Prereq. 22.221) 4 Cl.; 4 Q.H.
 Development of international organization with special emphasis on the United Nations system.
 Prof. Wilfong Spring Qtr.
- 22.233 International Law** (Prereq. 22.221) 4 Cl.; 4 Q.H.
 Territory and jurisdiction of states; treaties; recognition; peaceful settlement of disputes; resort to force.
 Prof. Wilfong Fall and Winter Qtrs.
- 22.261 Public Administration** (Prereq. 22.131) 4 Cl.; 4 Q.H.
 Introduction to the theory and practice of public administration with special emphasis on the generalities of institutions, processes, and behavior of bureaucratic organizations.
 Prof. Palmer Fall and Winter Qtrs.
- 22.271 Political Theory** (Prereq.: Senior status or consent of instructor) 4 Cl.; 4 Q.H.
 Analysis of various approaches to the fundamental problems of government and politics.
 Prof. Bursey Fall and Winter Qtrs.
- 22.272 Selected Issues in Political Theory** (Prereq. 22.271) 4 Cl.; 4 Q.H.
 Intensive examination of some dominant issues in modern political theory.
 Prof. Bursey Spring Qtr.

- 22.276 American Political Thought** (Prereq. 23.210, 23.211) 4 Cl.; 4 Q.H.
The contributions to political theory of the main social, economic, political, intellectual, and philosophic movements in America from the colonial period to the present.
Prof. Barkley Fall and Winter Qtrs.
- 22.280 Research Methods in Political Science** 4 Cl.; 4 Q.H.
An analysis of the various approaches to the study of political science. The systems of analysis to be evaluated include: institution, behavioral, legal, and analytical. Primarily for seniors majoring in political science.
Prof. Palmer Spring Qtr.
- 22.285 Senior Seminar in Political Science** 4 Cl.; 4 Q.H.
A study in depth of selected topics in political science. (Prerequisite: Student must be a major in political science and in his senior year.)
Prof. Barkley Spring Qtr.
- 22.290, 22.291 Directed Study** 4 Q.H.
Independent work under the direction of members of the department on a chosen topic. Limited to qualified seniors majoring in political science with approval of department.
Staff All Qtrs.
- 22.295, 22.296, 22.297, 22.298 Honors Program** (each) 4 Q.H.
Staff All Qtrs.

History

- 23.101 Western Civilization** 3 Cl.; 3 Q.H.
The beginnings of Western Civilization with emphasis on the political, economic, and social history of the ancient and medieval world.
Prof. Fullington and Staff Fall Qtr.
- 23.102 Western Civilization** 3 Cl.; 3 Q.H.
Modern Europe to 1850 with an examination of the two major intellectual movements—the Renaissance and the Enlightenment—and their impact upon religious movements, economic developments, and the rise of national states.
Prof. Fullington and Staff Winter Qtr.
- 23.103 Western Civilization** 3 Cl.; 3 Q.H.
Western Civilization since 1850, emphasizing the Scientific and Industrial Revolutions and their impact upon democracy and authoritarianism, nationalism and internationalism, and war and peace.
Prof. Fullington and Staff Spring Qtr.
- 23.111 Ancient Greece** 4 Cl.; 4 Q.H.
The origins and development of Greek civilization; political evolution of Hellenistic society from tribal to city-state organization; growth and application of Greek religious, political, and ethical ideas.
Prof Fullington Spring Qtr.

- 23.112 Ancient Rome** 4 Cl.; 4 Q.H.
 Roman civilization in two sequences: the rise of Roman power under the Republic, and the decline of Roman power under the Empire.
 To be announced Summer Qtr.
- 23.115 Medieval Europe** 4 Cl.; 4 Q.H.
 Europe from the decline of the Roman Empire to 1215; the development of Christianity and the expansion of the Church to Innocent III; the conflict between Pope and Holy Roman Emperor; manorialism and feudalism; the Christian philosophers and theologians; the growth of trade and towns.
 Prof. Francois Fall, Winter, and Spring Qtrs.
- 23.117 The Rise of Nation States** 4 Cl.; 4 Q.H.
 The political and economic life of Europe from the thirteenth to the end of the seventeenth century; monarchy and constitutional government; the growing conflict between church and state; the growth of capitalism and international trade.
 Mrs. Hamner Fall and Winter Qtrs.
- 23.118 The Renaissance and Reformation** 4 Cl.; 4 Q.H.
 European culture from the thirteenth to the seventeenth century; humanism; the rebirth of classicism in literature and the arts; the decline of the Church and the rise of Protestant sects; the social and cultural consequences of the religious wars.
 Mrs. Hamner Spring and Summer Qtrs.
- 23.120 Eighteenth Century Europe** 4 Cl.; 4 Q.H.
 Europe in the Age of Enlightenment, when concepts were advanced which produced sweeping changes in government and society.
 Not offered 1968-69
- 23.121 Nineteenth Century Europe** 4 Cl.; 4 Q.H.
 Europe during a century of dramatic transformation: the Industrial Revolution, the post-Napoleonic reaction, liberalism, socialism, nationalism, imperialism, and the coming of World War I.
 Prof. Anderson Spring Qtr.
- 23.122 Europe, 1870-1921** 4 Cl.; 4 Q.H.
 Europe from the Franco-Prussian War to the post-World War I settlement: the growing tensions and rivalries, and declining certainties of the end of the nineteenth century, the origins of World War I, the War itself, the Russian Revolution, and the peace of Paris. (Not open to students who intend to receive credit for 23.125).
 Mr. Herman Winter Qtr.
- 23.123 Europe since 1921** 4 Cl.; 4 Q.H.
 Europe from the Versailles settlement: the rise of totalitarianism, the depression, the crises of liberalism and of the European mind, the Appeasement Era, World War II, the Cold War, the end of colonialism, and Europe today. (Not open to students who intend to receive credit for 23.125).
 Prof. Backstrom and Mr. Herman Spring and Summer Qtrs.

- 23.125 Modern Europe (Group B)** 4 Cl.; 4 Q.H.
The coming of World War I, the rise of Communism and Fascism, the struggle for stability and social justice in the western democracies, World War II, and the Cold War. (Not open to students who intend to receive credit for 23.122 or 23.123).
Prof. Backstrom and Mr. Herman Fall and Winter Qtrs.
- 23.126 European Intellectual History Since 1815** 4 Cl.; 4 Q.H.
The main currents of European thought since Waterloo, considered in their social and political context.
Mr. Herman Fall and Winter Qtrs.
- 23.130 England to 1688** 4 Cl.; 4 Q.H.
Prehistoric Britain, the Anglo-Saxons, the Normans, the Plantagenets, the Tudors, and the Stuarts, with emphasis on the development of parliamentary institutions until the Glorious Revolution.
Prof. Francois and Mrs. Hamner Fall and Winter Qtrs.
- 23.131 England since 1688** 4 Cl.; 4 Q.H.
England from the Glorious Revolution to the present, with emphasis on the development of Parliament, the Industrial Revolution, nineteenth century reaction and reform, the world wars, and the rise of socialism.
Prof. Stembridge and Mrs. Hamner Spring and Summer Qtrs.
- 23.133 Stuart England** 4 Cl.; 4 Q.H.
England from 1603 to 1688, with emphasis on social and economic change and the origins of modern liberalism.
Not offered 1968-69
- 23.135 Victorian England** 4 Cl.; 4 Q.H.
The economic, social, and political life of the English people during Victoria's reign.
Prof. Backstrom Fall and Winter Qtrs.
- 23.137 England since 1900** 4 Cl.; 4 Q.H.
The economic, social, and political life of the English people in the twentieth century.
Prof. Backstrom Spring Qtr.
- 23.140 Imperial Russia** 4 Cl.; 4 Q.H.
The emergence of Russia as a recognized European power; westernization and expansion in the eighteenth century; the impact of Napoleon; reform and revolution.
Prof. Fullington Fall and Winter Qtrs.
- 23.141 Soviet Russia** 4 Cl.; 4 Q.H.
Forces molding the history of Russia since 1917; internal developments; foreign relations.
Prof. Fullington Spring and Summer Qtrs.

23.143 Ancient Middle East

4 Cl.; 4 Q.H.

From the origins of civilization in Egypt and Mesopotamia to the break-up of the ancient world in the fourth century with emphasis on religion and culture.

Mrs. Frothingham

Fall Qtr.

23.144 The Middle East, 315-1800

4 Cl.; 4 Q.H.

Contacts and conflicts between East and West, emphasizing the rise and flowering of Islam.

Mrs. Frothingham

Winter Qtr.

23.145 The Modern Middle East

4 Cl.; 4 Q.H.

The Middle East since 1800, with emphasis on the backgrounds of present problems.

Mrs. Frothingham

Spring and Summer Qtrs.

23.147 Africa before 1850

4 Cl.; 4 Q.H.

African pre-history; the formation of pre-modern societies; the dynamics of Afro-European contact before 1850.

Prof. Anderson

Fall and Winter Qtrs.

23.150 The Commonwealth Countries

4 Cl.; 4 Q.H.

The evolution of the British Empire into the Commonwealth of Nations and the development of the principal Commonwealth countries (excluding Africa). Special emphasis on the history of Canada, Australia, New Zealand, and India.

Prof. Stembridge

Fall, Winter, and Spring Qtrs.

23.151 Modern Africa

4 Cl.; 4 Q.H.

The European impact on Africa; the rise of African nationalism; the emergence of independent African states and the background of their present problems.

Prof. Anderson

All Qtrs.

23.169 Far Eastern Civilization to 1850

4 Cl.; 4 Q.H.

Premodern histories and cultures of China, Japan, and Korea from antiquity to 1850.

Prof. Anderson

Fall and Winter Qtrs.

23.170 Modern Far East

4 Cl.; 4 Q.H.

The Far East since 1850, with emphasis on China and Japan and their relations with other nations.

Prof. Anderson

Spring and Summer Qtrs.

23.199 The Historian's Craft

4 Cl.; 4 Q.H.

The ways in which the historian studies the past and the nature of historical statements. Problems considered include research techniques, changing conceptions of historical knowledge, and the relationship between the historian and the society in which he works.

Prof. Feer

Fall and Winter Qtrs.

23.201 Colonial America

4 Cl.; 4 Q.H.

The discovery and exploration of the New World; the settlement of the English colonies on the North American mainland; their development to 1763; and the origins of their clash with England.

Prof. Feer

Spring and Summer Qtrs.

23.210 The United States to 1865

4 Cl.; 4 Q.H.

The history of the American people from 1763 to 1865, with an analysis of the American Revolution and of the major political, constitutional, diplomatic, economic, and social problems of the new nation.

Prof. Robinson and Staff

Fall and Winter Qtrs.

23.211 The United States since 1865

4 Cl.; 4 Q.H.

A continuation of the survey of American history with discussion of the emergence of an industrial economy, an urban society, world responsibility, and expanded federal government.

Prof. Robinson and Staff

Spring and Summer Qtrs.

23.213 American Urban History

4 Cl.; 4 Q.H.

The development of urban society in the United States in the nineteenth and twentieth centuries, with emphasis on the effects of immigration and industrialization upon the politics, thought, and society of American cities.

To be announced

Fall and Winter Qtrs.

23.215 The United States, 1781-1825

4 Cl.; 4 Q.H.

The political, economic, and psychological problems of adjustment to peace at the conclusion of the American Revolution; the development of an independent nation to 1825.

Not offered 1968-69

23.217 Topics in American History, 1825-1900

4 Cl.; 4 Q.H.

An intensive analysis of selected topics in nineteenth century American history.

To be announced

Fall Qtr.

23.220 The United States, 1900-1928

4 Cl.; 4 Q.H.

Progressivism, World War I, and the reaction of the 1920's.

Prof. Bishop

Fall and Winter Qtrs.

23.221 The United States, 1928-1945

4 Cl.; 4 Q.H.

The Depression, the New Deal, World War II, and mid-century, emphasizing the clash between liberalism and conservatism and the movement from isolationism to interventionism.

Prof. Bishop

Spring and Summer Qtrs.

23.222 The United States since 1945

4 Cl.; 4 Q.H.

America's diverse responses to the postwar challenges of urbanization, economic change, civil rights, and communism.

To be announced

Summer Qtr.

- 23.223 Twentieth Century United States** 4 Cl.; 4 Q.H.
 The United States in the twentieth century, with an examination of the political, social, and economic characteristics of the major chronological periods: Progressivism, World War I, the 1920's, the New Deal, World War II, and mid-century. (Not open to students who intend to receive credit for 23.211, 23.220, 23.221.)
 Not offered 1968–69
- 23.230 The Westward Movement** 4 Cl.; 4 Q.H.
 America's westward movement in the nineteenth century and its impact on the political, social, and economic life of the nation.
 Not offered 1968–69
- 23.235 American Diplomatic History** 4 Cl.; 4 Q.H.
 The formation and administration of American foreign policy from the Revolution to the present.
 Mr. Jones Fall and Winter Qtrs.
- 23.236 Topics in American Diplomatic History (Group C)** 4 Cl.; 4 Q.H.
 A detailed analysis of recurrent problems in American diplomacy
 Mr. Jones Spring Qtr.
- 23.241 American Negro History** 4 Cl.; 4 Q.H.
 The history of Blacks in the English colonies and in the United States since the seventeenth century. The history of relations between White and Black Americans. The evolution of institutions and attitudes of Black Americans.
 To be announced Winter and Spring Qtrs.
- 23.250 American Hitorians** 4 Cl.; 4 Q.H.
 The literature of American history; major American writers of American history from the colonial period to the present, with emphasis on changing form and substance.
 Prof. Robinson Winter Qtr.
- 23.276 Latin America to 1850** 4 Cl.; 4 Q.H.
 The fusing of the cultures of the Indian, the Iberian, and the Negro; the European and American forces which gave rise to the Latin American wars for independence; the early development of the new nations.
 Prof. Bishop Fall and Winter Qtrs.
- 23.277 Modern Latin America** 4 Cl.; 4 Q.H.
 Latin America from the mid-nineteenth century to the present; dictatorial republics and the continuation of poverty and injustice; the struggles toward democracy, the rise of nationalism, and the threat of communism; the relations between the United States and Latin America.
 Prof. Bishop Spring and Summer Qtrs.
- 23.288 Seminar in Medieval History (Group A)** 4 Cl.; 4 Q.H.
 Prof. Rosenblatt Winter Qtr.

- 23.290 Seminar in Modern European History (Group B)** 4 Cl.; 4 Q.H.
Not offered 1968-69
- 23.291 Seminar in American History (Group C)** 4 Cl.; 4 Q.H.
Not offered 1968-69
- 23.295, 23.296, 23.297 Honors Program** 4 Q.H. each
Staff Fall, Winter, and Spring Qtrs.
- 23.299 Directed Study** 4 Cl.; 4 Q.H.
All Qtrs.

Philosophy and Religion

- 26.101 Introduction to Philosophy I** 4 Cl.; 4 Q.H.
What philosophy is, its methods, functions, and relations to other subjects; the nature of philosophical analysis, especially in regard to man's basic beliefs about knowledge and value; stress upon the justification of such basic beliefs and the clarification of the language and concepts in terms of which such beliefs are expressed.
Staff Fall and Winter Qtrs.
- 26.102 Introduction to Philosophy II**
(Prereq. 26.101 or consent of instr.) 4 Cl.; 4 Q.H.
A comparative analysis of some of the major types of philosophical systems in light of their differing views as to the nature of man, value, causality, purpose, and God; the important issues which have come out of the lasting dialogue among Naturalists, Materialists, Idealists, and Theists.
Staff Spring and Summer Qtrs.
- 26.110 History of Ancient Philosophy** 4 Cl.; 4 Q.H.
The beginnings of Greek philosophy before the time of Socrates; emphasis upon the thought and influence of Socrates, Plato, and Aristotle; secondary attention given to the Epicureans, the Stoics, and the Neo-Platonists.
Prof. Fogg Fall and Winter Qtrs.
- 26.111 History of Modern Philosophy**
(Prereq. 26.110 or consent of instructor) 4 Cl.; 4 Q.H.
European philosophy from the Renaissance to the nineteenth century; emphasis upon Francis Bacon, Descartes, Spinoza, Locke, Berkeley, Hume, and Kant.
Prof. Fogg Spring and Summer Qtrs.
- 26.117 Nineteenth Century Philosophy**
(Prereq. 26.110 or 26.111) 4 Cl.; 4 Q.H.
Selected trends in this century, such as the development of German Idealism, Romanticism, Evolutionism, Materialism, and Positivism. Hegel, Schopenhauer, Nietzsche, Marx, and Comte are representative.
Prof. Fogg Fall and Winter Qtrs.

26.118 Twentieth Century Philosophy

(Prereq. 26.110 or 26.111 or consent of instructor) 4 Cl.; 4 Q.H.

Contemporary philosophic movements such as realism, logical empiricism, linguistic analysis, pragmatism, and existentialism.

Prof. Michael

Fall and Winter Qtrs.

26.119 American Philosophy

(Prereq. 4 Q.H. of Philosophy) 4 Cl.; 4 Q.H.

A critical survey and analysis of the development of American philosophy from Puritanism to Pragmatism; emphasis upon Royce, Peirce, W. James, Dewey, and Whitehead.

Mrs. Gordon

Fall and Winter Qtrs.

26.120 Existentialism

(Prereq. 8 Q.H. of Philosophy) 4 Cl.; 4 Q.H.

The influence of Kierkegaard and Nietzsche upon twentieth century existentialism; its critique of scientific and traditional philosophy; the influence of existentialism upon literature and theology; emphasis upon Jaspers, Heidegger, Marcel and Sartre.

Prof. Michael

Spring and Summer Qtrs.

26.121 Analytic Philosophy

(Prereq. 26.150) 4 Cl.; 4 Q.H.

The development of logical empiricism; its conception of philosophy; its theories of meaning, knowledge, value, and its rejection of metaphysics; special emphasis given to the principles of verifiability.

To be announced

Spring and Summer Qtrs.

26.130 Aesthetics

(Prereq. 4 Q.H. of Philosophy) 4 Cl.; 4 Q.H.

A descriptive and critical investigation into the nature and meaning of aesthetic experience, art, and the principles of criticism; consideration of the possibility of standards in art and the relations of art to ethics, society, and religion.

Prof. Hacker

Spring and Summer Qtrs.

26.131 Social Philosophy

4 Cl.; 4 Q.H.

Critical examination of the leading socio-political ideologies in regard to their conceptions as to the character, structure, and function of society; emphasis upon a normative approach to the principles, means, and goals which underlie these major conceptions.

Mrs. Gordon

Spring and Summer Qtrs.

26.133 Philosophy of Science

(Prereq. 4 Q.H. of Logic) 4 Cl.; 4 Q.H.

An introduction to some of the crucial methodological problems in modern science; some of the topics are metaphysical presuppositions in science, concepts of causality, theory construction and theory reduction techniques, teleological and deterministic models, and the special methodological problems of the individual sciences.

Prof. Hacker

Spring Qtr.

26.134 Philosophy of Religion

(Prereq. 4 Q.H. of Philosophy) 4 Cl.; 4 Q.H.

What is religion? What are the basic conceptions of God? What are the arguments for and against belief in deity? The problem of natural and moral evil, the various beliefs in immortality, the cognitive status of theological statements.

Prof. Wellbank

Fall and Winter Qtrs.

- 26.135 Philosophy of History** (Prereq. 4 Q.H. of Philosophy) 4 Cl.; 4 Q.H.
The nature and problems of historical explanation; the function of value judgments and myth in such explanations; discussion of the Christian, Marxist, and Idealistic interpretations of history.
Prof. Fogg Spring and Summer Qtrs.
- 26.136 Philosophy of Education** 4 Cl.; 4 Q.H.
A critical analysis of the assumptions, functions, and procedures of educational policies and practices; theories about the nature, aims, and values of education within the wider context of a philosophy of man and society.
Prof. Hacker Fall and Winter Qtrs.
- 26.140 Elements of Philosophy** 3 Cl.; 3 Q.H.
Nature and spirit of philosophy; its relation to science, literature, and religion; main systems and the great ideas among philosophers; how philosophy applies to daily experience and its suggested answers to the perennial questions encountered by the thinking person.
Staff Fall and Winter Qtrs.
- 26.141 Problems of Philosophy** (Prereq. 26.140) 3 Cl.; 3 Q.H.
Continues the principal questions raised in 24.140. Attention to problems in the philosophy of religion and the relationships between the great religions of the world.
Staff Spring and Summer Qtrs.
- 26.142 Foundations in Ethics** 5 Cl.; 2.5 Q.H.
Right and wrong, good and evil, obligation and mature moral responsibility; nature of value judgments; chief schools of ethical thought; questions of freedom of choice, basic values, and recent trends.
To be announced Summer Qtr.
- 26.150 Introduction to Logic** 4 Cl.; 4 Q.H.
Formal principles of correct and incorrect reasoning, meaning, and significance of language; practical exercises in effective argument; and recognition of common fallacies.
Staff All Qtrs.
- 26.151 Symbolic Logic** (Prereq. 26.150 or consent of instructor) 4 Cl.; 4 Q.H.
An extensive analysis of class calculus and propositional logic; the techniques of matrix analysis; the axiomatic method; and natural deduction.
Prof. Hacker Spring and Summer Qtrs.
- 26.155 Ethics** 4 Cl.; 4 Q.H.
Nature and importance of ethics; its relation to philosophy, psychology, sociology, and religion; views of human nature; standards for morality; authoritarianism, naturalism, intuitionism, formalism, hedonism, relativism, and emotivism.
Prof. Wellbank Fall and Winter Qtrs.

- 26.156 Modern Ethical Theories** (Prereq. 26.155) 4 Cl.; 4 Q.H.
 Selected themes in ethics such as detailed analyses of ethical theories, modern theories of value, and the relations of ethical theory to epistemology and metaphysics; issues in meta-ethics.
 Prof. Wellbank Spring and Summer Qtrs.
- 26.170 Western Religions** 4 Cl.; 4 Q.H.
 Teachings of contemporary Judaism, Roman Catholicism, Protestantism, and Islam. Their interpretation of modern man's life and culture.
 Mr. Patchell Spring and Summer Qtrs.
- 26.171 Oriental Religions** 4 Cl.; 4 Q.H.
 Comparative study of beliefs and contributions of the oriental religions of our modern world. Emphasis upon Hinduism, Buddhism, Confucianism, and Taoism.
 Mr. Patchell Fall and Winter Qtrs.
- 26.173 Modern Religious Thinkers** (Prereq. 26.134) 4 Cl.; 4 Q.H.
 A consideration of such problems as the nature of religious language and symbols, psychology and religion, existentialism and theology, modern trends in theology; reading in the works of contemporary theologians and philosophers whose writings deal with these topics.
 Prof. Wellbank Spring Qtr.
- 26.180, 26.181 Seminars**
 (Prereq. 8 cr. hours of phil. or consent of instr.) 4 Cl.; 4 Q.H.
 Staff All Qtrs.
- 26.185, 26.186 Directed Studies**
 (Prereq. lim. to qualified seniors) 4 Cl.; 4 Q.H.
 With the consent of the department, majors may pursue a course of directed study and conferences under the supervision of a member of the staff.
 Staff All Qtrs.
- 26.190, 26.191, 26.192 Honors Program** (each) 4 Q.H.
 Staff All Qtrs.

Art

- 27.101 Foundations of Western Culture** 3 Cl.; 3 Q.H.
 The early world and ancient man; the ancient cultures of Mesopotamia, Egypt, Crete, Greece, and Rome.
 Staff Fall Qtrs.
- 27.102 Foundations of Western Culture** (Prereq. 27.101) 3 Cl.; 3 Q.H.
 The Early Christian and Byzantine periods; the Moslem World; European invasions and the Feudal Age.
 Staff Winter Qtr.

- 27.103 Foundations of Western Culture** (Prereq. 27.102) 3 Cl.; 3 Q.H.
The Gothic Age; the Renaissance; the Age of Exploration and Discovery, and European influences on American culture.
Staff Spring Qtr.
- 27.111 Elementary Drawing and Lettering** 2 Cl.; 4 Lab.; 4 Q.H.
Elementary mechanical drawing problems; Gothic, Roman, and Script lettering, and tracings in ink.
Offered 1969-70
- 27.112 Pictorial Drawing** (Prereq. 27.111) 2 Cl.; 4 Lab.; 4 Q.H.
Isometric, oblique, and cabinet drawings; linear perspective; and industrial production illustration.
Offered 1969-70
- 27.113 Creative Drawing** 4 Cl.; 4 Q.H.
Creative drawing problems in pen and ink, and pencil, with emphasis on form and texture; problems in illustration.
Prof. Wells Fall and Winter Qtrs.
- 27.114 Theory of Color and Design I** 4 Cl.; 4 Q.H.
Techniques and theories of design and color in painting. Students execute compositions in water color.
Prof. Wells Spring and Summer Qtrs.
- 27.115 Theory of Color and Design II** 6 Lab.; 4 Q.H.
Problems in landscape and still life painting, costume figure composition and illustration.
Prof. Wells Offered 1969-70
- 27.131 Ancient Art** 4 Cl.; 4 Q.H.
Materials and techniques employed by ancient artisans in architecture, sculpture and painting; prehistoric art and the arts of ancient Egypt, Mesopotamia, Crete, Greece, and Rome.
Prof. Davis Fall and Winter Qtrs.
- 27.132 Medieval Art** 4 Cl.; 4 Q.H.
Early Christian, Byzantine, Romanesque, and Gothic art.
Prof. Davis Spring and Summer Qtrs.
- 27.133 Italian Renaissance Art** 4 Cl.; 4 Q.H.
Italian Renaissance architecture, sculpture, and painting.
Mr. Serensi Fall and Winter Qtrs.
- 27.134 Byzantine Art** 4 Cl.; 4 Q.H.
Architecture, sculpture, painting and the minor arts of the Byzantine Empire from the fourth to the fifteenth centuries.
Prof. Dvorchak Spring and Summer Qtrs.

- 27.141 European Art** 4 Cl.; 4 Q.H.
The Baroque period of art and the European Renaissance period. Architecture, sculpture, painting, and the graphic arts up to the end of the nineteenth century.
Prof. Wells Fall and Winter Qtrs.
- 27.143 Latin American Art** 4 Cl.; 4 Q.H.
A study of Pre-Colombian art of the Archaic and Classical Periods to the European conquest of the Latin American lands.
Prof. Davis Spring Qtr.
- 27.151 Modern Painting** 4 Cl.; 4 Q.H.
The stylistic and historical development of painting from the late nineteenth century to the present.
Prof. Wells Spring and Summer Qtrs.
- 27.161 American Art I** 4 Cl.; 4 Q.H.
Development of American architecture, sculpture, and painting, from colonial times to about 1860.
Prof. Holden Fall and Winter Qtrs.
- 27.162 American Art II** 4 Cl.; 4 Q.H.
American architecture, sculpture, and painting from 1860 to the present.
Prof. Holden Spring and Summer Qtrs.
- 27.171 Ancient Architecture** 3 Cl.; 3 Q.H.
Prehistoric art and the art and architecture of Egypt, Mesopotamia, Crete, Greece, and Rome.
Prof. Havens Fall and Winter Qtrs.
- 27.172 Medieval and Renaissance Architecture** (Prereq. 27.171) 3 Cl.; 3 Q.H.
Early Christian, Byzantine, Romanesque, Gothic, and Italian Renaissance architecture.
Prof. Havens Spring and Summer Qtrs.
- 27.174 Modern Architecture** 4 Cl.; 4 Q.H.
Development of architecture in the 20th century from the work of Sullivan to the present.
Mr. Serensi Spring Qtr.
- 27.181 Oriental Art I** 4 Cl.; 4 Q.H.
The prehistoric arts of India, China, and Japan; the rise and spread of international Buddhist art; the national Indian styles of sculpture, architecture, and painting.
Prof. Havens Winter and Spring Qtrs.
- 27.182 Oriental Art II** 4 Cl.; 4 Q.H.
National styles of painting, sculpture, architecture, ceramics, and print-making in China, Korea, and Japan.
Prof. Havens Fall Qtr.

Music

28.100 Music I

4 Cl.; 4 Q.H.

A general, inclusive course which provides an overview of the world of music. This course emphasizes the listening experience. It introduces the student to a variety of vocal and instrumental forms and relates them to the historical eras during which they were created.

Staff

Fall and Winter Qtrs.

28.101 Music Theory

4 Cl.; 4 Q.H.

The study of notation, intervals, major and minor scales, modes, tonality, elementary chord structures and relationships. The course stresses the development of music reading skills.

Prof. Tesson

Fall and Winter Qtrs.

28.102 Music Fundamentals

4 Cl.; 4 Q.H.

Stresses the development of primary melodic, rhythmic, harmonic and contrapuntal concepts through sight singing, ear training, etc., and culminates in the creative application of materials.

Dr. Silverman

Spring and Summer Qtrs.

28.103 Music Form

4 Cl.; 4 Q.H.

Study of the major forms including Fugue, Rondo, Sonata form, Theme and Variations. Includes analysis of symphonic works, chamber works, and musical works using texts.

Prof. Bicknell

Fall and Winter Qtrs.

28.105 Music Composition I

(Prereq. 28.101 or 28.102) 4 Cl.; 4 Q.H.

(Limited to seminar size. Approval by the instructor)

The course begins with an analysis of Trouvere songs and continues with experiments in writing modal melodies and songs. In addition students writing practical rounds, part songs and other pieces with canonic structure. All creative essays in composition are encouraged.

Prof. Tesson

Spring and Summer Qtrs.

28.112 Music of the Baroque Era

4 Cl.; 4 Q.H.

The evolution of opera, oratorio, cantata and concerto in the works of such composers as Monteverdi, Corelli, Handel, Vivaldi, and Bach.

Not offered 1968-69

28.113 J. S. Bach

4 Cl.; 4 Q.H.

The music of J. S. Bach and of the era which produced him. Both the Church works and the secular works will be studied.

Prof. Bicknell

Spring and Summer Qtrs.

28.114 The Fugue

4 Cl.; 4 Q.H.

The great contrapuntal form of the Baroque era. The history of the Fugue from its origins in early vocal forms to the great works instrumental and

vocal by Bach and Handel. Important study is made of the use of the fugue in the works of later composers such as Beethoven.

Not offered 1968–69

28.115 Music of the Classical Era

4 Cl.; 4 Q.H.

The period in music history between Bach and Beethoven during which the symphony and the solo concerto ended. Aspects of "classical" style in instrumental and vocal works are discussed. Emphasis is placed on the music of Mozart and Haydn.

Prof. Nadeau

Spring and Summer Qtrs.

28.120 Survey of Music History

4 Cl.; 4 Q.H.

An inclusive study of the men, ideas and events that have shaped music history from ancient times through the Renaissance, Baroque, Classical, and Romantic eras to our own time. Among the composers whose works are studied are Josquin, Bach, Mozart, Beethoven, Wagner, Mahler, and Stravinsky.

Prof. Bicknell

Fall and Winter Qtrs.

28.121 Analytical Studies in the History of Music

(Prereq. 28.120 or equiv.) 4 Cl.; 4 Q.H.

Limited enrollment seminars which carry out in depth analyses of selected, significant topics in the history of music.

Prof. Bicknell

Spring and Summer Qtrs.

28.123 Music of the Romantic Era

4 Cl.; 4 Q.H.

Romantic realism and Romantic idealism after Beethoven. Composers to be studied include: Schumann, Schubert, Berlioz, Liszt, Chopin, Wagner, Brahms, Tchaikowsky, and Mahler.

Prof. Snyder

Fall and Winter Qtrs.

28.135 Music of the U.S.A.

4 Cl.; 4 Q.H.

American music from Colonial times to the present. Concert music as well as folk music, music of ethnic origin, and music of the theater are discussed.

Prof. Tesson

Fall and Winter Qtrs.

28.138 Nationalism in Music

4 Cl.; 4 Q.H.

This course is concerned with the phenomenon of national schools of music. The cultural (political and folk) forces that produce national schools and the stylistic elements of such schools are considered. Among the composers studied are, Sibelius and Finland. The "Five" and Russia, Bartok and Hungary, Ives and the United States.

Prof. Snyder

Spring and Summer Qtrs.

28.140 Mozart

4 Cl.; 4 Q.H.

A musical development from child prodigy to mature artist is carefully traced from his own letters and from biographies. Many of his major works, including operas, symphonies, concertos, and chamber works are analyzed in detail.

Not offered 1968–69

- 28.141 Music of the Twentieth Century** 4 Cl.; 4 Q.H.
The many developments in music since 1900 include Debussy's Impressionism and Schonberg's Expressionism, 12 tone, Electronic and chance music are carefully considered. Among the composers studied are Stravinsky, Bartok, and Hindemith, Berg, Webern, Ives, and Boulez.
Not offered 1968-69
- 28.142 Stravinsky** 4 Cl.; 4 Q.H.
The life and work of this major composer. Many of his works, for example, *Le Sacre*, *Petrouchka*, *Symphony of Psalms*, and more recent works are given detailed attention. His contributions to twentieth century style neo-classicism, pan diatonicism, additive style, are analyzed and his strong influence on other composers is noted.
Not offered 1968-69
- 28.143 Music in France** 4 Cl.; 4 Q.H.
The works and styles of French composers from Lully to Boulez. Special attention is paid to several figures like Berlioz and Debussy. Orchestral and operatic music is included in the course.
Prof. Nadeau Fall and Winter Qtrs.
- 28.145 Beethoven** 4 Cl.; 4 Q.H.
An analysis of the complex personality and art of this major figure. His relation to the turbulent times in which he lived, his role in classic and Romantic music.
Prof. Snyder Spring and Summer Qtrs.
- 28.146 Music of Germany** 4 Cl.; 4 Q.H.
The works and styles of German composers from Schutz to Henze. Special attention is paid to several figures like Beethoven and Wagner. Orchestral and operatic music is included in this course.
Not offered 1968-69
- 28.160 The Symphony** 4 Cl.; 4 Q.H.
A study of the symphony as the major genre in the Classical, Romantic, and Contemporary periods. Works by Haydn, Mozart, Beethoven, Schumann, Tchaikovsky, Brahms, Sibelius, and Prokofieff and others are studied.
Prof. Nadeau Fall and Winter Qtrs.
- 28.170 Chamber Music** 4 Cl.; 4 Q.H.
Ensemble pieces for small groups. Examples for analysis are selected from all periods from the Baroque to the present.
Prof. Bicknell Fall and Winter Qtrs.
- 28.180 Introduction to Opera** 4 Cl.; 4 Q.H.
Analysis of opera as a dramatic form. Aria, Recitative, Ensemble and other basic elements of opera are isolated and discussed. Opera buffa, members opera, music drama, sing piel are some of the types of opera considered. Composers whose works are analyzed include, Mozart, Wagner, Verdi, and Puccini.
Prof. Snyder Spring and Summer Qtrs.

28.181 Contemporary Opera

4 Cl.; 4 Q.H.

Almost every major composer including, Schonberg, Berg, Bartok, Stravinsky, Hindemith, and Poulenc have contributed to the opera repertory thus illustrating about every major 20th century style. Among the works studied are *Wozzeck*, *The Rake's Progress*, *Dialogue of Carmelites*, and *Bluebeard's Castle*.

Prof. Snyder

Fall and Winter Qtrs.

28.190 The Concerto

4 Cl.; 4 Q.H.

The concerto is studied from its origins in the Baroque era to its use in our own time. Concerti grosso as well as solo works for various instruments are studied in detail.

Prof. Nadeau

Spring and Summer Qtrs.

28.200 Jazz

4 Cl.; 4 Q.H.

Traces the history of jazz from its origins in New Orleans to the avant garde experiments of today. The rhythmic, harmonic, instrumental, and stylistic characteristics of jazz are analyzed. Attention is given to the work of creative jazz artists like Louis Armstrong, Charles Parker, and Duke Ellington.

Prof. Tesson

Spring and Summer Qtrs.

28.220 Music Criticism and Aesthetics

4 Cl.; 4 Q.H.

Examines major critical and philosophical views regarding the art of music. Traditional concepts regarding the relationship of form to content and communication.

Prof. Snyder

Fall and Winter Qtrs.

Drama and Speech

29.100 Public Speaking

3 Cl.; 3 Q.H.

Basic principles and techniques of effective modern speaking; emphasis on conversational delivery and clear, concise composition through group procedures, impromptu speaking, and the handling of short expository forms.

Staff

All Qtrs.

29.101 Public Speaking

(Prereq. 29.100) 3 Cl.; 3 Q.H.

Speech patterns which involve effective discussion; analysis, evidence, and reasoning as factors in convincing and persuading people.

Staff

All Qtrs.

29.102 Effective Speaking

3 Cl.; 3 Q.H.

Fundamentals of speaking, conferring, and reporting. The class is organized as a functional group with officers and agenda.

Staff

Fall, Winter, and Spring Qtrs.

29.105 Argumentation and Debate

4 Cl.; 4 Q.H.

Argumentation and debate presented as techniques of a free society, bringing reasoned discourse to bear on personal and social problems for purposes of decision and action, with attention being given to the various forms of debating techniques.

Not offered 1968-69

29.106 Speech Fundamentals

3 Cl.; 3 Q.H.

Basic principles and techniques of effective modern speaking. Examining individual voice and articulation problems. Studying and applying basic techniques of oral interpretation.

Prof. Woodnick

Fall Qtr.

29.108 Business and Professional Speaking

4 Cl.; 4 Q.H.

Designed for the individual business man and student seeking the business field, Business and Professional Speaking offers practice in oral presentations, group communication, conference and discussion techniques, interview methods and occasion speaking. The course combines performance aspects as well as case study methods of communication on the professional level.

To be announced

Fall and Winter Qtrs.

29.110 Voice and Articulation

4 Cl.; 4 Q.H.

Anatomy and physiology of the vocal mechanism; properly controlled breathing for phonation; resonance and articulation; correction of individual voice and articulation problems.

Prof. Woodnick

All Qtrs.

29.111 Oral Interpretation

(Prereq. 29.110 or permission) 4 Cl.; 4 Q.H.

Application of basic vocal techniques to the dramatic interpretation of various forms of literature, including the study of dialects and accents. Prerequisites 29—Voice and diction on permission of the instructor.

Mr. Eastman

Fall and Winter Qtrs.

29.112 Advanced Voice and Articulation

(Prereq. 29.110 or by permission of instructor) 4 Cl.; 4 Q.H.

Development and application of vocal technique acquired in 29.110; Emphasis on vocal analysis, flexibility, regional patterns of speech.

Prof. Woodnick

Spring and Summer Qtrs.

29.120 Introduction to Theatre Arts

4 Cl.; 4 Q.H.

A brief view of the historical development of acting, directing, and production design; emphasis on appreciation of contemporary theatrical forms.

Prof. Phillips

Spring and Summer Qtrs.

29.125 Introduction to the Theatre

3 Cl.; 3 Q.H.

Theatre history and tradition; samplings of dramatic literature from the great ages of theatre; theatre as a mirror of society; the rise of theatre as a profession and as an art form; the role of the playwright, director, and actor; the audience as critic.

Prof. Blumsack

Fall and Winter Qtrs.

29.126 Play Production

(Prereq. 29.125) 3 Cl.; 3 Q.H.

Solving the problems posed by the script: interpretation, style, design, lighting and construction; the technical man as an artist who gains an appreciation of theatre through solving the artistic and technical problems of production: theatre architecture; stage mechanics; principles of lighting, construction, and design.

Prof. Blumsack

Spring and Summer Qtrs.

- 29.130 Makeup** 4 Cl.; 4 Q.H.
Examining the principles of, the reasons for, and the materials used in makeup for the theatre, television, and films. The practical application of types and styles of makeup.
Prof. Blumsack Winter Qtr.
- 29.150 Acting** 4 Cl.; 4 Q.H.
Fundamental techniques of acting; use of body and voice in dramatic interpretation; training in strengthening imagination and increasing freedom; analysis of script; improvisation in preparation for work on the script.
Prof. Kaplan Fall and Winter Qtrs.
- 29.151 Acting** (Prereq. 29.150) 4 Cl.; 4 Q.H.
Intermediate techniques of the actor's work; detailed analysis of the script including action and vocal score; character interpretation; scenes and one-act plays.
Prof. Kaplan Spring and Summer Qtrs.
- 29.152 Theories and Styles of Performance** (Prereq. 29.151) 4 Cl.; 4 Q.H.
Advanced acting techniques; study of acting styles in major theatrical periods and participation in classroom exercises; scenes and one-act plays.
Not offered 1968-69
- 29.160 Concepts of Direction** 4 Cl.; 4 Q.H.
For drama majors only or by permission of instructor. The theories of dramatic presentation through analysis of selected historical directorial developments; purposes and techniques of theatrical direction as they relate to script analysis, production style, pictorial composition, rhythmic evolution, emphatic responses.
Prof. Blackman Fall and Winter Qtrs.
- 29.161 Problems in Direction** (Prereq. 29.160) 4 Cl.; 4 Q.H.
Experimentation of theory related to the staging of classical and modern drama; analysis of plays for actual production; casting; rehearsals; character interpretations. Each student is responsible for the production of a one-act play.
Not offered 1968-69
- 29.162 Elements of Play Production** 4 Cl.; 4 Q.H.
Coordinating the work of the production and business staffs; the functions of the stage manager, business manager, and subordinate departmental heads; their relationship with associates; the conduct of production preparations, rehearsals and performance.
Not offered 1968-69
- 29.163 Workshop in Play Production** 4 Cl.; 4 Q.H.
A course for the recreation teacher and leader in school, camp, settlement house, playground to train him in the selection, planning, and organization of both informal and formal dramatics activities.
Prof. Blumsack Fall and Winter Qtrs.

29.166 Shakespearean Production

(Prereq. a course in Shakespeare and 29.161) 4 Cl.; 4 Q.H.

A detailed analysis of three types of Shakespearean plays—the tragedy (the tragedy of blood), the comedy, the history—with the aims of discovering the production values and of determining the production methods to mount the types successfully in the modern theatre.

Not offered 1968–69

29.170 Scenic Production

4 Cl.; 4 Q.H.

Principles which underlie scenic coordination and development; basic propositions governing techniques of dramatic architecture; production materials; color and light.

Prof. Blumsack

Spring Qtr.

29.171 Design and Lighting

(Prereq. 29.170) 4 Cl.; 4 Q.H.

The basic principles of design and lighting for the stage; historical analysis of composition and design from classical to modern periods; execution of designs for productions.

Not offered 1968–69

29.175 Costuming

4 Cl.; 4 Q.H.

Investigation of the historical development of dramatic costuming as it relates to the unified dramatic concept; execution of theories associated with visual projection, line, color, dark and light.

To be announced

Fall and Winter Qtrs.

29.180 Playwriting

4 Cl.; 4 Q.H.

The principles and practices of modern dramatic composition: characterization, plot, plot structure, dialogue, and other dramaturgical elements as seen in the one-act play; the writing of brief scenes; the dramatic, and the one-act play.

Prof. Phillips

Fall and Winter Qtrs.

29.181 Playwriting

(Prereq. 29.180 or permission) 4 Cl.; 4 Q.H.

A continuation of 29.180. The writing of the longer plays. Each student will be required to submit the equivalent of a full-length play.

Not offered 1968–69

29.185 Children's Theatre

4 Cl.; 4 Q.H.

Theories and methods of relating creative techniques to work with children's programs in schools, churches, and recreational facilities; analysis of literature in preparation for production of plays for children.

Prof. Blackman

Spring and Summer Qtrs.

29.186 Educational Theatre

4 Cl.; 4 Q.H.

Drama and drama activities in community, social, health, and educational agencies. Organizing and directing young people's theatre programs.

Prof. Blackman

Fall and Winter Qtrs.

29.200 History of the Theatre

4 Cl.; 4 Q.H.

Development of the theatre and the drama of Greece and Rome, medieval Europe, Elizabethan and Restoration England, and 17th century France; an examination of playwriting, acting styles, scene design, theatre architecture, and the relationship among these elements.

Prof. Phillips

Fall and Winter Qtrs.

29.201 History of the Theatre

4 Cl.; 4 Q.H.

Development of the European theatre of the 18th, 19th, and early 20th centuries; growth and development of the proscenium theatre; the emphasis upon naturalistic and realistic presentation; the theatre innovations.

Prof. Phillips

Spring and Summer Qtrs.

29.202 The Classic Theatre of Greece and Rome

4 Cl.; 4 Q.H.

The beginnings of theatre and its growth as a potent institution and as an art form. A detailed study of the interrelation of the dramatic form and the theatre structure and the works of the major playwrights.

Not offered 1968-69

29.205 The Restoration Theatre

4 Cl.; 4 Q.H.

The philosophical, social, historical, critical influences upon the Restoration Theatre and its dramatists.

Not offered 1968-69

29.210 The American Theatre

4 Cl.; 4 Q.H.

The American Theatre from the Revolutionary War to the present.

Prof. Phillips

Fall and Winter Qtrs.

29.211 The Theatre of Williams, Miller, and Albee

4 Cl.; 4 Q.H.

The American playwright reflecting the current social, philosophical, psychological dilemma.

Prof. Phillips

Spring and Summer Qtrs.

29.230 Contemporary Theatre

4 Cl.; 4 Q.H.

The contemporary forces that shape the trends in the present day theatre with an emphasis upon the works and ideas of O'Neill, Wilder, Pirandello, Lorca, Brecht, Beckett, Ionesco, Genet, Pinter, and Albee.

Prof. Kaplan

Fall and Winter Qtrs.

29.231 The Theatre of the Absurd

4 Cl.; 4 Q.H.

The Theatre of the Absurd as a mirror of present Existentialist thinking and its effects upon the history of Western Drama.

Prof. Kaplan

Spring and Summer Qtrs.

29.240 Drama Criticism

4 Cl.; 4 Q.H.

The development of modern dramatic theory and criticism through the work of the chief drama critics of the past, with special attention to the rise of journalistic play reviewing and its role in criticism.

Not offered 1968-69

29.280 Senior Project

4 Cl.; 4 Q.H.

A final project required of each senior student within the major to demonstrate his proficiency and creativeness in one area of the theatre arts: play-writing, design, directing.

Prof. Blackman

Spring Qtr.

English

30.101 English

3 Cl.; 3 Q.H.

Important principles of logic and rhetoric applied to exposition and argumentation writing; review of sentence structure, punctuation, and paragraphing; extensive reading and analysis of the essay form; theme assignments.

Prof. Norvish in charge

Fall Qtr.

30.102 English

(Prereq. 30.101) 3 Cl.; 3 Q.H.

Preparation, organization, and documentation of student reports and critical essays; practice in library research; study of scholarship in, and interpretation of, classical novels.

Prof. Norvish, et. al.

Winter Qtr.

30.103 English

(Prereq. 30.102) 3 Cl.; 3 Q.H.

Introduction to literature; aims and techniques of the short story, drama and poetry; the writing of short literary critiques.

Prof. Norvish, et. al.

Spring Qtr.

30.104 Intermediate Writing

(Prereq. 30.101, 30.102, 30.103 or equiv.) 4 Cl.; 4 Q.H.

The development of various skills to increase command of written language; practice in using experience as a source of materials for writing; reading and analysis of student papers and selected examples of professional writing. Composition includes exercises in characterization, mood, dialogue, sensory details, situation, personal essay, short short story, dramatic sketches.

Profs. Kazantzi, Berry

Fall and Winter Qtrs.

30.105 Intermediate Writing

(Prereq. 30.104) 4 Cl.; 4 Q.H.

Analysis of literary techniques of prose and poetry; completion of 10,000 words of manuscript; development of the imagination through exercises in shaping experience; discussion of student papers. Composition includes poetry, short story, drama, novelette.

Profs. Kazantzi, Berry

Spring and Summer Qtrs.

30.108 Advanced Composition

4 Cl.; 4 Q.H.

The writing of poetry; practice in various forms and strategies of verse, with specific assignments in different modes; discussion and criticism of student work and selected texts.

To be announced

Fall and Winter Qtrs.

- 30.109 Advanced Composition** (Prereq. 30.108) 4 Cl.; 4 Q.H.
The writing of fiction; practice in the writing of fiction, including some longer forms; discussion and criticism of student work and selected texts.
To be announced Spring and Summer Qtrs.
- 30.110 Literary Analysis, Poetry** 4 Cl.; 4 Q.H.
Close reading of selected poems, mastery of critical terms, practice in varied critical approaches to poetry. A number of critical papers will be written. Required of English majors.
Prof. Kazantzi Fall and Winter Qtrs.
- 30.111 Literary Analysis, Novel** 4 Cl.; 4 Q.H.
A formal study of selected plays, mastery of critical terms, practice in varied critical approaches. A number of critical papers will be written. English majors are required to take either 30.111 or 30.112.
Staff Fall and Winter Qtrs.
- 30.112 Literary Analysis, Drama** 4 Cl.; 4 Q.H.
A formal study of selected plays, mastery of critical terms, practice in varied critical approaches. A number of critical papers will be written. English majors are required to take either 30.112 or 30.111.
Staff Spring and Summer Qtrs.
- 30.120 Introduction to Linguistics** 4 Cl.; 4 Q.H.
Nature and origin of language; both distinctive and shared features of the Indo-European languages; general phonetics; Grimm's and Verner's laws; effects of stress; economy of effort; analogy; borrowings; etymology, etc.
Prof. Barrs Fall and Winter Qtrs.
- 30.121 Foundations of the English Language** 4 Cl.; 4 Q.H.
Development of Modern English from pre-Anglo-Saxon beginnings; effects of the Scandinavian invasions and of the Norman Conquest; changes in phonology, morphology, syntax, and meanings; sources of the vocabulary; the making of words; dialectology; English as an international language; the problem of spelling.
Prof. Barrs Spring and Summer Qtrs.
- 30.124 Traditional Grammar** 4 Cl.; 4 Q.H.
A reappraisal of traditional grammar in the light of recent advances in grammatical theory; the practical application of such grammar in both studying and teaching English as a medium of expression; supplementary readings by way of transition to the newer grammars.
Prof. Barrs Fall and Winter Qtrs.
- 30.125 Grammatical Analysis** 4 Cl.; 4 Q.H.
An attempt to understand and apply the newer grammar, especially the structural.
Prof. Barrs Spring and Summer Qtrs.

30.130 Introduction to Semantics

4 Cl.; 4 Q.H.

The relation between language and behavior; levels of abstraction in communication; habits of evaluation of linguistic phenomena, and the modification of such habits in the direction of human understanding and survival.

To be announced

30.149 Shakespearean Plays

5 Cl.; 2.5 Q.H.

Four Shakespearean plays are read and discussed with special attention to character, motivation, situation, and adaptation to the Elizabethan stage.

To be announced

Summer Qtr.

30.151 The Modern Novel

4 Cl.; 4 Q.H.

Outstanding novels of the 20th century, with emphasis on literary trends and implied social outlook.

Prof. Reynolds

Fall and Winter Qtrs.

30.152 Modern Drama

4 Cl.; 4 Q.H.

Native and European drama since 1880, with emphasis on the relationship between drama and society in the 20th century.

To be announced

30.170 Survey of English Literature

4 Cl.; 4 Q.H.

English literature to 1800. (Not open to students taking 30.174, 30.175.)

Profs. Blois, Griffin

Fall and Winter Qtrs.

30.171 Survey of English Literature

4 Cl.; 4 Q.H.

English literature from 1800 to the present. (Not open to students taking 30.176, 30.177.)

Profs. Blois, Griffin

Spring and Summer Qtrs.

30.174 English Literature I

(Prereq. 30.110) 4 Cl.; 4 Q.H.

English literature from Beowulf to Spenser. Required of English majors.

Profs. Rosen, Sledd

Fall and Winter Qtrs.

30.175 English Literature II

(Prereq. 30.110, 30.111 or 30.112) 4 Cl.; 4 Q.H.

English literature from Shakespeare to Dryden. Required of English majors.

Profs. Rosen, Sledd

Spring and Summer Qtrs.

30.176 English Literature III

(Prereq. same as 30.175) 4 Cl.; 4 Q.H.

English literature from Pope to Byron. Required of English majors.

To be announced

Fall and Winter Qtrs.

30.177 Survey of English Literature IV

(Prereq. same as 30.175) 4 Cl.; 4 Q.H.

English literature from Tennyson to T. S. Eliot. Required of English majors.

To be announced

Spring and Summer Qtrs.

30.180 Survey of American Literature

4 Cl.; 4 Q.H.

American literature to 1860. (Not open to students taking 30.184.)

Prof. Rosen and Staff

Fall and Winter Qtrs.

30.181 Survey of American Literature

4 Cl.; 4 Q.H.

American literature from 1860 to the present. (Not open to students taking 30.185.)

Prof. Rosen and Staff

Spring and Summer Qtrs.

30.182 Major American Novels

4 Cl.; 4 Q.H.

An intensive analysis of the themes, forms, and techniques of nine novels by four American novelists of the nineteenth and early twentieth centuries, with special emphasis on James. Critical papers will be required.

Prof. Rosen

Fall and Winter Qtrs.

30.183 Major American Novels

(Prereq. 30.182 or the Instructor's consent.) 4 Cl.; 4 Q.H.

An intensive analysis of the themes, forms, and techniques of nine modern novels by four American novelists, with special emphasis on Faulkner. Critical papers will be required.

Prof. Rosen

Spring and Summer Qtrs.

30.184 American Literary Figures

(Prereq. 30.110 and 30.111 or 30.112) 4 Cl.; 4 Q.H.

A detailed study of selected American authors from Colonial times and the mid-nineteenth century.

Prof. Morse

Fall and Winter Qtrs.

30.185 American Literary Figures

(Prereq. same as 30.184) 4 Cl.; 4 Q.H.

A detailed study of selected American authors from the mid-thirteenth century to the present.

Prof. Morse

Spring and Summer Qtrs.

30.195, 30.196, 30.197 Advanced Placement for Freshmen

3 Q.H.

Prof. Norvish in charge

30.200 Western World Literature I

4 Cl.; 4 Q.H.

A study of major literary forms of classical Greece, especially the epic, drama, and dialogue, authors such as Homer, Plato, Aristotle, the dramatists.

Prof. Khiralla

Fall and Winter Qtrs.

30.201 Western World Literature II

4 Cl.; 4 Q.H.

A study of major literary forms of the ancient Roman Empire, especially the epic, drama and oration. Readings from such writers as Vergil, Horace, Ovid, Cicero.

Prof. Khiralla

Spring and Summer Qtrs.

30.202 Western World Literature III

4 Cl.; 4 Q.H.

A study of major literary forms in the European tradition from the medieval period to the 19th century. Readings from such writers as Dante, Calderon, Milton, Racine, Corneille, Johnson, and Goethe.

To be announced

Fall and Winter Qtrs.

30.203 Western World Literature IV

4 Cl.; 4 Q.H.

A study of major trends and literary forms of the twentieth century, European and American. Readings from such writers as Kafka, Camus, Sartre, Ionesco, Becket, and Albee.

To be announced

Spring and Summer Qtrs.

30.210 Major British Novelists

4 Cl.; 4 Q.H.

The eighteenth century English novel, with special attention to Defoe, Fielding, Smollett, Sterne, the Gothic novelists, and Austen; the development of the English novel and the characteristic quality of eighteenth century fiction.

Prof. Stump

Fall and Winter Qtrs.

30.211 Major British Novelists

4 Cl.; 4 Q.H.

The nineteenth century English novel, with special attention to the Brontës, Thackeray, Trollope, Eliot, Meredith, Gissing, and Hardy; the Victorian frame of mind, as seen in the novels.

Prof. Stump

Spring and Summer Qtrs.

30.216 Topics in the Modern Novel

4 Cl.; 4 Q.H.

Intensive study of literary and intellectual traditions from the point of view of selected twentieth century writers. The works emphasize the power of spiritual insight and question the position of modern man in the universe. Among writers discussed will be Dostoevsky, Conrad, Kafka, Salinger, Hemingway, Forster, Woolf, and Huxley.

To be announced

Fall and Winter Qtrs.

30.217 Topics in the Modern Novel

4 Cl.; 4 Q.H.

Attempts to apply similar analyses and studies of the aesthetic forms by which the artist presents his vision of life. Among writers discussed will be James, Lawrence, Greene, Joyce, Faulkner, Updike, Amis, Durrell.

To be announced

Spring and Summer Qtrs.

30.220 Major British Dramatists

(Prereq. 2 courses in lit.) 4 Cl.; 4 Q.H.

The origins, themes, form, techniques and poetry of Elizabethan and Jacobean drama in such dramatists as Kyd, Webster, Tourneur, Fletcher and Beaumont, with particular emphasis on the works of Marlowe, Jonson and Ford.

To be announced

Fall and Winter Qtrs.

30.221 Major British Dramatists

(Prereq. 2 courses in lit.) 4 Cl.; 4 Q.H.

Contemporary British drama with particular emphasis on the poetic and experimental in the works of Shaw, Synge, Yeats, O'Casey, Eliot, Behan, Pinter and Beckett.

To be announced

Spring and Summer Qtrs.

30.222 Chaucer

(Prereq. 2 courses in lit.) 4 Cl.; 4 Q.H.

Chaucer's early poems and selected *Canterbury Tales*.

Not offered 1968-69

- 30.223 Chaucer** (Prereq. 30.222) 4 Cl.; 4 Q.H.
Selected *Canterbury Tales* and portions of *Troilus*.
Not offered 1968–69
- 30.224 Spenser** (Prereq. 2 courses in lit.) 4 Cl.; 4 Q.H.
Selected early poems and portions of the *Faerie Queene*.
Not offered 1968–69
- 30.225 Milton** (Prereq. 2 courses in lit.) 4 Cl.; 4 Q.H.
Concentration on Milton's *Paradise Lost* with supplementary readings in his minor poems and prose.
Not offered 1968–69
- 30.230 Seventeenth Century English Literature** (Prereq. 2 courses in lit.) 4 Cl.; 4 Q.H.
Major writers of the first half of the century with special emphasis on Bacon, Jonson and the metaphysical poets, Donne and Herbert; the effect of science on the literature and the thinking of the times.
Not offered 1968–69
- 30.231 Seventeenth Century English Literature** (Prereq. 2 courses in lit.) 4 Cl.; 4 Q.H.
Major writers of the second half of the century with emphasis upon Dryden and Milton. Satire as a literary genre, and its relationship to the times.
Not offered 1968–69
- 30.236 Eighteenth Century English Literature** 4 Cl.; 4 Q.H.
Significant dramatic works of the period and the writings of Pope and Swift are treated.
Prof. Berry Fall and Winter Qtrs.
- 30.237 Eighteenth Century English Literature** 4 Cl.; 4 Q.H.
Writings of Dr. Johnson, Boswell, and Blake.
Prof. Berry Spring and Summer Qtrs.
- 30.240 Nineteenth Century English Literature** (Prereq. 2 courses in lit.) 4 Cl.; 4 Q.H.
The poetry of Blake, Wordsworth, Coleridge, Shelley and Keats and some related critical material; the relationship between the poetry and the time.
To be announced Fall and Winter Qtrs.
- 30.241 Nineteenth Century English Literature** (Prereq. 2 courses in lit.) 4 Cl.; 4 Q.H.
The poetry of Victorian England with special emphasis upon that of Tennyson and Browning; reading of related critical material; the relationship between the poetry and the time.
To be announced Spring and Summer Qtrs.
- 30.246 Twentieth Century Literature** (Prereq. 2 courses in lit.) 4 Cl.; 4 Q.H.
The modern movement in English and American literature from 1890 to 1920, against its background and its context of symbolism, naturalism, expressionism, and other related movements. Writers to be studied include H. G. Wells, Arnold Bennett, the early Yeats, the early Frost and the Georgian and Imagist Poets.
Prof. Sledd Fall and Winter Qtrs.

- 30.247 Twentieth Century Literature** (Prereq. 2 courses in lit.) 4 Cl.; 4 Q.H.
The modern movement in English and American literature from 1920 to the present. Writers to be studied include Hemingway, Fitzgerald, Faulkner, Yeats, Virginia Woolf, Frank O'Connor, Stevens, W. C. Williams, Auden, Thomas, the "angry generation," the "new" poets, and fiction writers since World War II.
Prof. Sledd Spring and Summer Qtrs.
- 30.250 Shakespeare** 4 Cl.; 4 Q.H.
A chronological approach to Shakespeare's plays, beginning with *Romeo and Juliet* and ending with *Julius Caesar*. Emphasis on diction, dramatic structure and psychology.
Profs. Kanzantzi, Skiffington Fall and Winter Qtrs.
- 30.251 Shakespeare** 4 Cl.; 4 Q.H.
Shakespeare's middle and last phases; *Hamlet* to *The Tempest*; selected plays.
Profs. Kazantzi, Skiffington Spring and Summer Qtrs.
- 30.260 The Bible** 4 Cl.; 4 Q.H.
Selected books of the Bible considered in their literary and historical aspects.
Prof. Blois Fall and Winter Qtrs.
- 30.280 Senior Seminar** 2 Cl.; 2 Q.H.
The writings of significant American dramatists are studied in order to help the student to develop an understanding and appreciation of American drama. Attention is paid to developing the student's ability to do individual research.
To be announced Fall and Winter Qtrs.
- 30.281 Senior Seminar** 2 Cl.; 2 Q.H.
The writings of significant American dramatists are studied in order to help the student to broaden and deepen his understanding and appreciation of American drama. Attention is paid to improving the student's ability to do individual research.
To be announced Spring Qtr.
- 30.295, 30.296, 30.297, 30.298 Honors Program** (each) 4 Q.H.

French

- 31.101 Elementary French** 3 Cl.; 3 Q.H.
Essentials of grammar; practice in pronunciation; and progressive acquisition of a basic vocabulary and idiomatic expressions.
Prof. Williams and Staff Fall Qtr.
- 31.102 Elementary French** (Prereq. 31.101) 3 Cl.; 3 Q.H.
Continuation of grammar study. Oral and written exercises.
Prof. Williams and Staff Winter Qtr.

- 31.103 Elementary French** (Prereq. 31.102) 3 Cl.; 3 Q.H.
Reading of French prose of increasing difficulty, with written and oral exercises based on the material read; practice in conversation.
Prof. Williams and Staff Spring Qtr.
- 31.111 Intermediate French** 3 Cl.; 3 Q.H.
Course for freshmen who have had two or three years of high school French. A review of grammar with practice in composition and conversation.
Prof. Fabrizi and Staff Fall Qtr.
- 31.112 Intermediate French** (Prereq. 31.111) 3 Cl.; 3 Q.H.
History of French civilization and discussions and conversation.
Prof. Fabrizi and Staff Winter Qtr.
- 31.113 Intermediate French** (Prereq. 31.112) 3 Cl.; 3 Q.H.
Intensive reading of modern French prose, with conversational practice.
Prof. Fabrizi and Staff Spring Qtr.
- 31.115 Intermediate French** (Prereq. 31.103 or 31.152) 4 Cl.; 4 Q.H.
Course for upperclassmen. Review of grammar. History of French civilization, with discussions and conversation.
Prof. Stephan and Staff Fall and Winter Qtrs.
- 31.116 Intermediate French** (Prereq. 31.115) 4 Cl.; 4 Q.H.
Intensive reading of modern French prose, with conversational practice.
Prof. Stephan and Staff Spring and Summer Qtrs.
- 31.117 French Composition and Conversation** (Prereq. 31.113 or 31.116) 4 Cl.; 4 Q.H.
General grammar review; written work; and conversation.
Prof. Fabrizi Fall and Winter Qtrs.
- 31.118 French Composition and Conversation** (Prereq. 31.117) 4 Cl.; 4 Q.H.
Free composition; oral reports; and class discussions.
Prof. Fabrizi Spring and Summer Qtrs.
- 31.119 French Literature in the Twentieth Century** (Prereq. 31.113 or 31.116) 4 Cl.; 4 Q.H.
Narrative and dramatic prose from 1900 to the present. Among writers included are Colette, Duhamel, Renard, Rolland, Proust, and Anatole France.
Offered in 1969-70
- 31.120 French Literature in the Twentieth Century** (Prereq. 31.113 or 31.116) 4 Cl.; 4 Q.H.
Recent French literature as illustrated by Gide, Mauriac, Camus, Satre, and others.
Offered in 1969-70

31.121 French Literature in the Nineteenth Century

(Prereq. 31.113 or 31.116) 4 Cl.; 4 Q.H.

Origin and development of the Romantic movement in France; selected poems by Lamartine, Hugo, Musset, and Vigny; characteristic Romantic prose and drama.

Prof. Stephan

Fall and Winter Qtrs.

31.122 French Literature in the Nineteenth Century

(Prereq. 31.113 or 31.116) 4 Cl.; 4 Q.H.

Parnassian and Symbolist poetry; the Realistic and Naturalistic novel; the plays of Dumas fils, Augier, Becque, and Rostand.

Prof. Stephan

Spring and Summer Qtrs.

31.123 French Classicism

(Prereq. 31.113 or 31.116) 4 Cl.; 4 Q.H.

Background and non-dramatic literature of the seventeenth century; selections from Malherbe, Descartes, Pascal, La Fontaine, Mme. de Sévigné, Mme. de La Fayette, Bossuet, and Fénelon.

Prof. Williams

Fall and Winter Qtrs.

31.124 French Classicism

(Prereq. 31.113 or 31.116) 4 Cl.; 4 Q.H.

Dramatic theories, especially by Boileau; plays by Corneille, Molière, and Racine.

Prof. Williams

Spring and Summer Qtrs.

31.127 Survey of French Literature

(Prereq. 4 yrs. of high school French) 3 Cl.; 3 Q.H.

Medieval masterpieces in modern French versions, with emphasis on the *Chanson de Roland*, *Tristan et Iseut*, and the novels of Chrétien de Troyes.

Prof. Stephan

Fall Qtr.

31.128 Survey of French Literature

(Prereq. 30.127) 3 Cl.; 3 Q.H.

French Literature of the fifteenth and sixteenth centuries, with particular attention to Villon, Rabelais, Montaigne and the poets of the Pléiade.

Prof. Stephan

Winter Qtr.

31.129 Survey of French Literature

(Prereq. 31.128) 3 Cl.; 3 Q.H.

Brief discussion of the seventeenth century; the writings of the "philosophers," particularly Diderot and Voltaire, with some attention to Rousseau, Beaumarchais, and André Chénier.

Prof. Stephan

Spring Qtr.

31.130 Applied French Linguistics

(Prereq. 30.120) 4 Cl.; 4 Q.H.

For teachers or prospective teachers of French. Phonemes and allophones; breath groups and sentences; intonation patterns; comparison between oral and written French.

Not offered 1968-69

31.151 Elementary French

4 Cl.; 4 Q.H.

Course for upperclassmen. Essentials of grammar; practice in pronunciation; progressive acquisition of a basic vocabulary and idiomatic expressions.

Prof. Williams and Staff

Fall and Winter Qtrs.

- 31.152 Elementary French** (Prereq. 31.151) 4 Cl.; 4 Q.H.
Continuation of grammar study; oral and written exercises; reading of French prose of increasing difficulty; practice in conversation.
Prof. Williams and Staff Spring and Summer Qtrs.
- 31.185 Directed Study** 4 Q.H.
Staff
- 31.295, 31.296, 31.297, 31.298; Honors Program** (each) 4 Q.H.
Staff

Spanish

- 32.101 Elementary Spanish** 3 Cl.; 3 Q.H.
Essentials of grammar; practice in pronunciation; progressive acquisition of a basic vocabulary and idiomatic expressions.
Dr. Riesco and Staff Fall Qtr.
- 32.102 Elementary Spanish** (Prereq. 32.101) 3 Cl.; 3 Q.H.
Continuation of grammar study. Oral and written exercises; reading of Spanish prose of moderate difficulty.
Dr. Riesco and Staff Winter Qtr.
- 32.103 Elementary Spanish** (Prereq. 32.102) 3 Cl.; 3 Q.H.
Continuation of grammar study. Oral and written exercises; reading of Spanish prose of moderate difficulty.
Dr. Riesco and Staff Spring Qtr.
- 32.111 Intermediate Spanish** 3 Cl.; 3 Q.H.
Intermediate course for freshmen who have had two or three years of high school Spanish. Review of grammar, with practice in composition and conversation.
Prof. Jaramillo and Staff Fall Qtr.
- 32.112 Intermediate Spanish** (Prereq. 32.111) 3 Cl.; 3 Q.H.
Spanish civilization through texts of average difficulty. Intensive reading of modern prose, with occasional oral or written translation; conversation practice based on assigned readings.
Prof. Jaramillo and Staff Winter Qtr.
- 32.113 Intermediate Spanish** (Prereq. 32.112) 3 Cl.; 3 Q.H.
Spanish-American civilization through texts of average difficulty. Intensive reading of modern prose, with occasional oral or written translation; conversation practice based on assigned readings.
Prof. Jaramillo and Staff Spring Qtr.
- 32.115 Intermediate Spanish** (Prereq. 32.103 or 32.152) 4 Cl.; 4 Q.H.
Spanish civilization through texts of average difficulty. Intensive reading of modern prose, with occasional oral and written translation; conversation practice based on assigned readings.
Mr. Modée and Staff Fall and Winter Qtrs.

- 32.116 Intermediate Spanish** (Prereq. 32.115) 4 Cl.; 4 Q.H.
 Spanish-American civilization through texts of average difficulty. Intensive reading of modern prose, with occasional oral or written translation; conversation practice based on assigned readings.
 Mr. Modee and Staff Spring and Summer Qtrs.
- 32.117 Spanish Composition and Conversation** (Prereq. 32.113 or 32.116) 4 Cl.; 4 Q.H.
 Practice in writing and speaking Spanish, including written and oral résumés, prepared speeches and themes, impromptu speaking and writing; a review of the more subtle problems of grammar.
 Prof. Jaramillo Fall and Winter Qtrs.
- 32.118 Spanish Composition and Conversation** (Prereq. 32.117) 4 Cl.; 4 Q.H.
 Further practice in oral and written Spanish; continued study of problems of advanced Spanish grammar.
 Prof. Jaramillo Spring and Summer Qtrs.
- 32.119 Spanish American Literature** (Prereq. 32.113 or 32.116) 4 Cl.; 4 Q.H.
 Early Latin American literature; the literature of the colonial period and the early nineteenth century based primarily on selections from an anthology.
 Offered in 1969-70
- 32.120 Spanish American Literature** (Prereq. 32.119) 4 Cl.; 4 Q.H.
 Modern Latin American literature; readings from the modernistic period: selections from the prose of Rodo, Gallegos, Alegria, Quiroga, Azuela, and others.
 Offered in 1969-70
- 32.121 A Survey of Medieval Spanish Literature** (Prereq. 32.113 or 32.116) 4 Cl.; 4 Q.H.
 Selections from the *Poema de Mio Cid*, *Alfonso XII*, *Gonzalo de Berceo*, *El Arcipreste de Hita*, *La Celestina*; and others.
 Mr. Modee Fall and Winter Qtrs.
- 32.122 Fifteenth and Sixteenth Century English Literature** (Prereq. 32.113 or 32.116) 4 Cl.; 4 Q.H.
 Selections from the romancero (ballads), Garcilasso de la Vega, Fray Luis de Leon, San Juan de la Cruz, Santa Teresa, and the picaresque novel.
 Mr. Modee Spring and Summer Qtrs.
- 32.123 Literature of the Golden Age** (Prereq. 32.113 or 32.116) 4 Cl.; 4 Q.H.
 Cervantes; selections from the *Entremeses*, the *Novelas Ejemplares*, and *Don Quijote*, with emphasis on the latter as Spain's greatest literary masterpiece.
 Offered in 1969-70
- 32.124 Literature of the Golden Age** (Prereq. 32.113 or 32.116) 4 Cl.; 4 Q.H.
 Readings from the *comedias* of Lope de Vega, Tirso de Molina, Calderon, and Ruiz de Alarcon; also prose and poetry selections of Gongora and Quevedo.
 Offered in 1969-70

32.125 Nineteenth Century Spanish Literature

(Prereq. 32.113 or 32.116) 4 Cl.; 4 Q.H.

Readings in prose, poetry, and drama of the romantic period, including selections from El Duque de Rivas, Larra, Espronceda, Zorrilla, and Bécquer.

Offered in 1969-70

32.126 Nineteenth Century Spanish Literature

(Prereq. 32.113 or 32.116) 4 Cl.; 4 Q.H.

The realistic period; prose and drama selections from the works of Echegaray, Tamayo y Baus, Alarcon, Pereda, Valera, Galdos, and Clarin.

Offered in 1969-70

32.127 Twentieth Century Spanish Literature

(Prereq. 32.113 or 32.116) 4 Cl.; 4 Q.H.

Selections from the writings of the Generation of '98: Unamuno, Valle-Inclán, Pío Baroja, Benavente, Azorín, and the Machado brothers.

Prof. Jaramillo

Fall and Winter Qtrs.

32.128 Twentieth Century Spanish Literature

(Prereq. 32.113 or 32.116) 4 Cl.; 4 Q.H.

Prose and poetry of modern writers, such as Ortega y Gasset, Pérez de Ayala, García Lorca, Juan Ramon Jiménez, Gironella, and José Cela.

Prof. Jaramillo

Spring and Summer Qtrs.

32.151 Elementary Spanish

4 Cl.; 4 Q.H.

Course for upperclassmen. Essentials of grammar; practice in pronunciation; progressive acquisition of a basic vocabulary and idiomatic expressions.

Prof. Jaramillo and Staff

Fall and Winter Qtrs.

32.152 Elementary Spanish

(Prereq. 32.151) 4 Cl.; 4 Q.H.

Continuation of grammar study. Oral and written exercises; reading of Spanish prose of moderate difficulty.

Prof. Jaramillo and Staff

Spring and Summer Qtrs.

German

33.101 Elementary German

3 Cl.; 3 Q.H.

Essentials of grammar; practice in pronunciation; progressive acquisition of a basic vocabulary and idiomatic expressions.

Prof. Aluf and Staff

Fall Qtr.

33.102 Elementary German

(Prereq. 33.101) 3 Cl.; 3 Q.H.

More difficult points of grammar, particularly uses of subjunctive mood.

Prof. Aluf and Staff

Winter Qtr.

33.103 Elementary German

(Prereq. 33.102) 3 Cl.; 3 Q.H.

Reading of simple German prose, with oral and written exercises based on material read; German conversation encouraged.

Prof. Aluf and Staff

Spring Qtr.

- 33.111 Intermediate German** 3 Cl.; 3 Q.H.
Intermediate course for freshmen who have had two or three years of high school German. A review of grammar; practice in composition and conversation.
Prof. Aluf and Staff Fall Qtr.
- 33.112 Intermediate German** (Prereq. 33.111) 3 Cl.; 3 Q.H.
History of German civilization, with discussions and conversation.
Prof. Aluf and Staff Winter Qtr.
- 33.113 Intermediate German** (Prereq. 33.112) 3 Cl.; 3 Q.H.
Intensive reading of modern German prose, with conversational practice.
Prof. Aluf and Staff Spring Qtr.
- 33.115 Intermediate German** (Prereq. 33.103) 4 Cl.; 4 Q.H.
German civilization through texts of average difficulty; review of grammar; written and oral exercises.
Miss Boehme Fall and Winter Qtrs.
- 33.116 Intermediate German** (Prereq. 33.115) 4 Cl.; 4 Q.H.
Readings from modern German prose; conversational practice.
Miss Boehme Spring and Summer Qtrs.
- 33.117 German Composition and Conversation** (Prereq. 33.113 or 33.116) 4 Cl.; 4 Q.H.
Grammar review; written work; German conversation.
Miss Boehme Fall and Winter Qtrs.
- 33.118 German Composition and Conversation** (Prereq. 33.117) 4 Cl.; 4 Q.H.
Free composition; oral reports; class discussions.
Miss Boehme Spring and Summer Qtrs.
- 33.119 Scientific German** (Prereq. 33.113 or 33.116) 4 Cl.; 4 Q.H.
Review of grammar; readings in scientific German: articles dealing with chemistry, physics, mathematics and biology.
Prof. Aluf Fall and Winter Qtrs.
- 33.120 The German Lyric** (Prereq. 33.113 or 33.116) 4 Cl.; 4 Q.H.
German lyric poetry from the twelfth century to the present; analysis of selected poems; reports; discussions.
Prof. Aluf Spring and Summer Qtrs.
- 33.121 The Works of Goethe** (Prereq. 33.113 or 33.116) 4 Cl.; 4 Q.H.
Dramas, prose writings, and lyric poetry of Goethe; lectures, collateral readings; reports.
Prof. Cooperstein Fall and Winter Qtrs.
- 33.122 Classical Period of German Literature** (Prereq. 33.113 or 33.116) 4 Cl.; 4 Q.H.
Background and general survey of the period from 1750 to 1800, with particular emphasis on the works of Lessing and Schiller.
Prof. Cooperstein Spring and Summer Qtrs.

33.123 German Drama of the Nineteenth Century

(Prereq. 33.113 or 33.116) 4 Cl.; 4 Q.H.

Plays by Kleist, Hebbel, Grillparzer, and Ludwig; lectures, collateral readings; reports.

Offered in 1969–70

33.124 Nineteenth Century German Literature

(Prereq. 33.113 or 33.116) 4 Cl.; 4 Q.H.

Background and general survey of German literature in the nineteenth century, with particular attention to prose and lyric poetry.

Offered in 1969–70

33.125 German Drama of the Twentieth Century

(Prereq. 33.113 or 33.116) 4 Cl.; 4 Q.H.

Plays by Schnitzler, Hofmannsthal, Wedekind, Kaiser, Toller, Unruh, and Wiechert.

Offered in 1970–71

33.126 German Literature of the Twentieth Century

(Prereq. 33.113 or 33.116) 4 Cl.; 4 Q.H.

Recent German literature, particularly prose and lyric poetry.

Offered in 1970–71

33.151 Elementary German

4 Cl.; 4 Q.H.

Course for upperclassmen. Essentials of grammar; practice in pronunciation; acquisition of a basic vocabulary; idiomatic expressions.

Prof. Aluf and Staff

Fall and Winter Qtrs.

33.152 Elementary German

(Prereq. 33.151) 4 Cl.; 4 Q.H.

More difficult points of grammar; reading of simple German prose, with oral and written exercises.

Prof. Aluf and Staff

Spring and Summer Qtrs.

Russian

34.101 Elementary Russian

3 Cl.; 3 Q.H.

Essentials of grammar; practice in pronunciation and progressive acquisition of a basic vocabulary; idiomatic expressions.

Prof. Spiegel and Staff

Fall Qtr.

34.102 Elementary Russian

(Prereq. 34.101) 3 Cl.; 3 Q.H.

Continuation of grammar study; oral and written exercises.

Prof. Spiegel and Staff

Winter Qtr.

34.103 Elementary Russian

(Prereq. 34.102) 3 Cl.; 3 Q.H.

Reading of Russian prose of moderate difficulty.

Prof. Spiegel and Staff

Spring Qtr.

- 34.115 Intermediate Russian** (Prereq. 34.103 or 34.152) 4 Cl.; 4 Q.H.
Graded reading from the works of Pushkin, Lermontov and Turgenev; oral and written practice based on the covered material.
Mr. Snyder Fall and Winter Qtrs.
- 34.116 Intermediate Russian** (Prereq. 34.115) 4 Cl.; 4 Q.H.
Russian history and civilization through texts of average difficulty; oral practice and composition based on covered material.
Mr. Snyder Spring and Summer Qtrs.
- 34.117 Russian Composition and Conversation** (Prereq. 34.116) 4 Cl.; 4 Q.H.
Written and oral themes based on everyday situations and on current articles from the Soviet and Western press.
Not offered 1968-69
- 34.118 Russian Composition and Conversation** (Prereq. 34.117) 4 Cl.; 4 Q.H.
Continuation of 34.117.
Not offered 1968-69
- 34.119 Scientific Russian** (Prereq. 34.116) 4 Cl.; 4 Q.H.
Reading of selected Russian texts dealing with chemistry, physics, mathematics, and biology.
Not offered 1968-69
- 34.121 The Russian Short Story** (Prereq. 34.116) 4 Cl.; 4 Q.H.
The evolution of this genre; readings of the finest short stories of nineteenth and twentieth century authors.
Prof. Spiegel Fall and Winter Qtrs.
- 34.122 The Russian Drama** (Prereq. 34.116) 4 Cl.; 4 Q.H.
The evolution of this genre; readings of the representative plays of nineteenth and twentieth century playwrights.
Prof. Spiegel Spring and Summer Qtrs.
- 34.123 Russian Folklore** (Prereq. 34.116) 4 Cl.; 4 Q.H.
Presentation of the development of the various genres of folk literature through lectures, readings, and tape recordings.
Offered in 1969-70
- 34.124 Highlights of Russian Poetry** (Prereq. 34.116) 4 Cl.; 4 Q.H.
Reading and analysis of selected poems by classical and modern authors.
Offered in 1969-70
- 34.151 Elementary Russian** 4 Cl.; 4 Q.H.
Course for upperclassmen. Essentials of grammar; practice in pronunciation; progressive acquisition of a basic vocabulary; idiomatic expressions.
Mr. Snyder Fall and Winter Qtrs.
- 34.152 Elementary Russian** (Prereq. 34.151) 4 Cl.; 4 Q.H.
Continuation of grammar study. Oral and written exercises; reading of Russian prose of moderate difficulty.
Mr. Snyder Spring and Summer Qtrs.

Journalism

38.101 History and Principles of Journalism

4 Cl.; 4 Q.H.

Development of American journalism from European and English beginnings; the problems and contributions of the "Colonial Press," the Revolutionary War period, the "Party Press," the "Penny Press," and the leading contributions to early American journalism; the evolution of freedom of the press and the concurrent responsibility of the press media to this freedom; some writing.

Prof. Speers

Fall and Winter Qtrs.

38.102 History and Principles of Journalism

4 Cl.; 4 Q.H.

A continuation of 38.101 from mid-nineteenth century; America's great personal journalists and mass circulation "giants" and their contributions: Greeley, Bennett, Raymond, Dana, Grady, Nelson, Ochs, White, Medill, Pulitzer, Hearst, Scripps, Howard, McCormick and others; the relationships to journalism to such events as the Civil War, the Spanish American War; the unfolding principles; some writing.

Prof. Speers

Spring Qtr.

38.103 Fundamentals of Newswriting

4 Cl.; 4 Q.H.

Functions of the editorial department and procedures in obtaining and writing news stories; extensive practice in writing news stories.

Mr. Azer and Mr. Quarrington

Fall and Winter Qtrs.

38.104 Fundamentals of Newswriting

(Prereq. 38.103 or consent of instructor) 4 Cl.; 4 Q.H.

Problems of reporting and news writing with written assignments in various types of spot news reporting.

Mr. Azer and Mr. Quarrington

Spring and Summer Qtrs.

38.105 Techniques of Journalism

(Prereq. 38.104 or consent of instructor) 4 Cl.; 4 Q.H.

Advanced practice in writing news stories along with editorials, feature stories, criticisms, etc.

Mr. Azer and Mr. Quarrington

Fall and Winter Qtrs.

38.106 Techniques of Journalism

(Prereq. 38.105 or consent of instructor) 4 Cl.; 4 Q.H.

Editing the news with practice in copy editing, headline writing, and newspaper makeup.

Mr. Azer and Mr. Quarrington

Spring and Summer Qtrs.

38.107 The Press and Society

2 Cl.; 2 Q.H.

The relationships of the press media to American society; the various roles of the press; the unfolding legislative pattern before and after the First Amendment; some outstanding court cases concerning the press such as contempt of court, licensing, taxing the press; relationships between the press and the U.S. Post Office. A study project, working with professional newspapers, is required.

Prof. Speers

Fall and Winter Qtrs.

38.108 The Press and Society

2 Cl.; 2 Q.H.

Some of the major legal considerations concerning the press media, such as libel and slander, right of privacy, the public's "right to know"; some current and past restrictive legislation; the growing specialization of the press, including new aspects of it, such as public relations and publicity. A study project, working with professional newspapers, is required.

Prof. Speers

Spring Qtr.

Economics

39.104 Introduction to Economic Growth and Development and Economic Institutions

4 Cl.; 4 Q.H.

An examination, through a historical survey, of the rise and development of the Western market system; economic growth and the alternative approaches to economic development; the economic institutions that are characteristic of the American economy; fundamental economic problems and policy alternatives that our society may utilize to contend with these problems.

Mr. Hordon

Fall Qtr.

39.105 Principles of Economics

3 Cl.; 3 Q.H.

Development of macro-economic analysis; review of national income accounting and concepts; national income determination, fluctuation, and growth; contraction and expansion analyzed through the circular flow of money payments; role of the banking system and the Federal Reserve System; government expenditures and taxation; international trade: balance of international payments, law of comparative advantage, tariff protection versus free trade.

Prof. Caligaris

Fall and Winter Qtrs.

39.106 Principles of Economics

(Prereq. 39.105) 3 Cl.; 3 Q.H.

Comprehensive analysis of the economics of the firm with illustrative cases. Demand, cost and output relationships examined under marginal analysis and alternatives, such as break-even charts, cost-plus pricing and sales maximization. Market structures, factors of production, and investment given special treatment. Market structures and the public interest includes examination of anti-trust policy, economic efficiency, research and innovation, advertising, and economic concentration. Some emphasis placed on theory versus practice.

Prof. Caligaris

Spring and Summer Qtrs.

39.115 Principles and Problems of Economics

4 Cl.; 4 Q.H.

An introduction to the conceptual aspects of economics. The flow of national income; economic growth and fluctuations; the role of money and banking; monetary and fiscal policies; emphasis on developing conceptual tools for use in the analysis of economic problems facing modern society.

Prof. Herman in charge

Fall and Winter Qtrs.

39.116 Principles and Problems of Economics

4 Cl.; 4 Q.H.

A continuation of the approach developed in 39.115 but oriented to the particular roles of consumer, labor, business firms, government, agriculture and other segments of the modern economy; the international economy and differences between economic systems; emphasis on the understanding of how the pricing system determines resource allocation, production efficiency and the distribution of income.

Prof. Herman in charge

Spring and Summer Qtrs.

39.125 Economics

3 Cl.; 3 Q.H.

Macro-economic problems, theory and policy; basic economic concepts and the institutional setting of the American economic system, its goals and problems; national income and product definition and measurement; the theory of income determination; the relation between prices and money; the mechanics of commercial banking operations, central banking and monetary policy; government and fiscal policy; appraisal of stabilization policies; economic growth theory and problems.

Prof. Herman in charge

Fall and Winter Qtrs.

39.126 Economics

3 Cl.; 3 Q.H.

Micro-economics: the pricing of national output and distribution of national income; the theory of demand and utility; the economics of the firm; cost and supply; partial equilibrium analysis; price determination under various market structures; the theory of production; the pricing of productive factors in various market structures; international economic problems and policies; the theory of international trade; the balance of payments; current international economic problems.

Prof. Herman in charge

Spring and Summer Qtrs.

39.250 Statistics

(Prereq. 39.116 or 39.106) 4 Cl.; 4 Q.H.

This course builds from a base of descriptive statistics (control tendency, dispersion, grouped and ungrouped data, etc.) toward an introductory level of statistical inference (sampling, probability, expected value, probability distributions and statistical estimation); emphasis on business decision-making under uncertainty and on the key role of probability theory which enables us to use sampling data to estimate unknown parameters with measurable risk of error.

To be announced

Fall and Winter Qtrs.

39.251 Statistics

(Prereq. 39.250) 4 Cl.; 4 Q.H.

Continuation of investigation of decision-making under uncertainty; continuation in field of statistical inference with hypothesis testing, quality control charts, regression-correlation analysis, and time series analysis.

To be announced

Spring and Summer Qtrs.

39.255 Micro-economic Theory

(Prereq. 39.116 or 39.106) 4 Cl.; 4 Q.H.

A detailed study of supply and demand analysis; various elasticity concepts and applications; theory of consumer demand; theory of production; derivation of cost curves; detailed analysis of pricing; and output behavior in the several market structures with their welfare implications; the pricing of resources.

Prof. Meehan

Fall and Winter Qtrs.

- 39.256 Macro-economic Theory** (Prereq. 39.116 or 39.106) 4 Cl.; 4 Q.H.
Investigation of the conceptual and empirical problems of creating and using national accounts; price index problems; conceptual and empirical evaluation of several consumption and investment functions, and their policy implications; multiplier and accelerator models; a brief history of recent cyclical fluctuations. Theories of inflation and growth are analyzed in the light of recent economic history.
Prof. Meehan Spring and Summer Qtrs.
- 39.259 European Economic History** 4 Cl.; 4 Q.H.
Short Greco-Roman and Middle Ages background. Economic inheritance of the nineteenth Century; development of capitalism and laissez faire; the aftermath of the industrial revolution; European overseas expansion. The twentieth century; the world wars; the dissolution of empires; American economic conquest and European integration; the future of less developed areas in southern Europe.
Prof. Schachter Fall and Winter Qtrs.
- 39.260 American Economic History** (Prereq. 39.116 or 39.106) 4 Cl.; 4 Q.H.
Economic development of U.S. from colonial period to the present; historical changes in available factors, economic institutions and technologies; special attention to preconditions of industrialism; U.S. industrial revolution, its spread and socio-economic consequences; great depression, subsequent rise of mixed economy and welfare state; U.S. adjustments to post-war economic changes.
Prof. Shelby Fall and Winter Qtrs.
- 39.265 Money and Banking** (Prereq. 39.116 or 39.106) 4 Cl.; 4 Q.H.
The functioning of the monetary and banking system as a whole, and its relationships with the rest of the economy. Topics will include the functions of money and credit, commercial banking, central banking, monetary theory, international monetary relations, and monetary policy.
Prof. Caligaris Spring and Summer Qtrs.
- 39.266 Government Finance and Fiscal Policy** (Prereq. 39.116 or 39.106) 4 Cl.; 4 Q.H.
Governmental expenditure, revenue, and debt systems, with emphasis upon their economic effects and their relationships to principles of economic welfare; topics such as principles of taxation; income taxation; consumption basis of taxation; taxation of wealth; the commercial principle; and governmental borrowing and fiscal policy.
Prof. Goldstein Fall and Winter Qtrs.
- 39.271 Social Control of Economic Activities** (Prereq. 39.116 or 39.106) 4 Cl.; 4 Q.H.
Historical development of the government's role in economic affairs; the relationships between the government and industry, labor, agriculture, public utilities, consumers; economy in general; anti-trust laws and their effects on market structure and performance; theoretical analysis of interaction of various sectors of the economy.
Prof. Horowitz Fall and Winter Qtrs.

- 39.275 Labor Economics** (Prereq. 39.116 or 39.106) 4 Cl.; 4 Q.H.
Examination of the economics of the labor market and the labor force and of the institutions and policies dealing with them; employment, unemployment, wage determination, income distribution, and the development and efficient use of labor resources; development of trade unions; collective bargaining issues and their economic consequences.
Prof. Herrnstadt Fall and Winter Qtrs.
- 39.280 Comparative Economics** (Prereq. 39.116 or 39.106) 4 Cl.; 4 Q.H.
Competing types of theoretical economic systems; empirical analysis of administration and operations of currently existing types of communist, socialist, and capitalist economies; comparisons in terms of economic functions; evaluation of economic performance in terms of announced goals.
Prof. Shelby Spring and Summer Qtrs.
- 39.281 Mathematical Economics** (Prereq. 39.255 and 39.256) 4 Cl.; 4 Q.H.
Functions and diagrams in Economic Theory: demand, revenue and cost functions; economic applications of derivatives with references to monopoly and duopoly problems; exponential and logarithmic functions with reference to compound interest problems; functions of two variables with reference to production and utility functions; Euler's Theorem and other properties of homogeneous functions.
Mr. Gostenhofer Fall and Winter Qtrs.
- 39.282 Mathematical Economics** (Prereq. 39.281) 4 Cl.; 4 Q.H.
Linear models and matrix algebra; properties of determinants; Cramer's rule, etc. Leontief input-output analysis; applications to market and national income. Dynamic analysis including difference equations applied to various models. Some applications from linear programming, game theory and econometrics.
Mr. Gostenhofer Spring and Summer Qtrs.
- 39.285 Economic Development** (Prereq. 39.116 or 39.106) 4 Cl.; 4 Q.H.
Prospects for economic growth in poor nations as indicated by economic analysis and historical experience; social, cultural, and institutional determinants of growth; implications for the international position and policies of the U.S.
Prof. Schachter Spring and Summer Qtrs.
- 39.286 International Economics** (Prereq. 39.116 or 39.106) 4 Cl.; 4 Q.H.
Analysis of international economic principles, balance of payments mechanism and international organizations; relevance for international trade problems and policies of recent times.
Prof. Graubard Spring Qtr.
- 39.288 Economic Growth and Business Cycles** (Prereq. 39.116 or 39.106) 4 Cl.; 4 Q.H.
Review of macro-economic theory and national product accounts; U.S. economic performance; nature and meaning of U.S. growth; general causes and recent empirical studies; prognosis, and growth policies; meaning and

types of business cycles; details of business cycle theories; recent cyclical experience; current situation; brief survey of forecasting techniques; critical examination of current and proposed anti-cyclical programs.

Prof. Shelby

Fall and Winter Qtrs.

- 39.289 Advanced Economic Theory** (Prereq. 39.255 and 39.256) 4 Cl.; 4 Q.H.
Advanced theoretical treatment of selected topics in microeconomics and macroeconomics. Recommended for students planning to take graduate economics.

To be announced

Spring Qtr.

- 39.291 Senior Economics Seminar** (Prereq. 39.255 and 39.256) 4 Cl.; 4 Q.H.
Course for senior economics majors, coordinating and apply economic concepts, methodology, and data to contemporary issues and problems of broad social, economic, and philosophical importance.

To be announced

Spring Qtr.

- 39.292 History of Economic Thought** (Prereq. 39.116 or 39.106) 4 Cl.; 4 Q.H.
Comprehensive course of study in the development of economic thought. Coverage includes mercantilism as the first economic doctrine; analysis of older classical school, its later refinements (modern marginalism), and its important critics (socialists, marxists); Keynesian and modern developments.

Prof. Lake

Fall and Winter Qtr.

- 39.293 Statistical Methods** (Prereq. 39.251) 4 Cl.; 4 Q.H.
Principles of probability and statistical inference. Topics include estimation and tests of significance, analysis of variance, comparison of Bayesian and classical inference, and combinatorial analysis; application of methods of statistical inference to business and economic research. Computer programming introduced. Offered to qualified seniors.

Prof. Lyons

Fall and Winter Qtrs.

- 39.294 Statistical Methods** (Prereq. 39.293) 4 Cl.; 4 Q.H.
Introduction to principles of management science. Covers matrix algebra; multiple regression models; linear programming models including the simplex and transportation problems; simulation, queuing theory, and statistical decision theory; general development of mathematical models in the solution of business problems; technique of the logarithms; solution of problems with the 1620 computer.

Prof. Lyons

Spring and Summer Qtrs.

- 39.295, 39.296, 39.297, 39.298 Honors Program** (each) 4 Q.H.
Prof. DeCicco in charge

Accounting

- 41.111 Principles of Accounting** 4 Cl.; 3 Q.H.
The accounting cycle procedure; the analysis of financial transactions; preparation of financial statements; and special journals.

Prof. Burnham and Staff

Fall Qtr.

- 41.112 Principles of Accounting** (Prereq. 41.111) 4 Cl.; 3 Q.H.
The matching of revenue and expense; the control of cash and receivables; inventory valuation; plant and equipment; control of cash disbursement; corporation accounting.
Prof. Burnham and Staff Winter Qtr.
- 41.113 Principles of Accounting** (Prereq. 41.112) 4 Cl.; 3 Q.H.
Managerial financial decisions; corporate financial reporting; consolidated financial statements; source and uses of funds; cash flow; price level changes.
Prof. Burnham and Staff Spring and Summer Qtrs.
- 41.115 Principles of Accounting** 10 Cl.; 9 Q.H.
Covers the content of courses 41.111, 41.112, 41.113. Intended for Transfer Students.
Prof. Burnham Fall Qtr.
- 41.203 Introduction to Accounting—I.E.** 4 Cl.; 4 Q.H.
The accounting cycle; analysis tools defined; statement preparation; control of cash, receivables, inventory, and equipment; introduction to manufacturing accounting.
Prof. Armen Fall and Winter Qtr.
- 41.205 Cost Accounting** (Prereq. 41.113) 3 Cl.; 3 Q.H.
Basic cost theory and practice; cost data as management tool, cost volume-profit analysis; introduction to capital budgeting.
To be announced All Qtrs.
- 41.207 Analysis of Financial State** (Prereq. 41.113) 3 Cl.; 3 Q.H.
Preparation of accounting statements; uses of ratios and analytical statements; composition of statements and statement classification; fund and cash flow analysis.
Prof. Richards Winter Qtr.
- 41.208 Introduction to Accounting—Pharmacy** 4 Cl.; 4 Q.H.
Uses of accounting; recording processes; trading enterprises; alternative recording systems; analytical uses of accounting; payroll accounting; planning and forecasting from accounting data.
Prof. Burnham, in charge Spring and Summer Qtrs.
- 41.209 Distribution Cost Analysis** (Prereq. 41.113) 4 Cl.; 4 Q.H.
Cost accounting with a major emphasis toward applications for marketing purposes; cost accumulation and analysis; uses of costs and cost techniques for control. Pricing will be stressed.
Prof. Slavin Spring and Summer Qtrs.
- 41.210 Accounting Principles** (Prereq. 39.116) 4 Cl.; 4 Q.H.
For Liberal Arts undergraduates. Accounting as an analytical tool of management; financial statement analysis; corporate financial reporting; investments; financial planning.
Prof. Armen Spring and Summer Qtrs.

- 41.213 Federal Income Taxes** (Prereq. 41.113) 4 Cl.; 4 Q.H.
 A basis survey course of the federal tax structure; an appreciation and understanding of the impact of taxation on business decision. Application of tax principles will be illustrated by specific problems. Estate and trust planning.
 Prof. Malchman Winter and Spring Qtrs.
- 41.212 Accounting Analysis for Decision Making** (Prereq. Cost for Management or equiv.) 4 Cl.; 4 Q.H.
 This course builds up the students basic knowledge of accounting, providing him with the opportunity to analyze accounting data for use in management decisions. The course stresses use of the information as opposed to its compilation, and relates the work through case problems involving decision making at middle and upper management levels. Areas covered include cost control, capital investment, product mix, transfer pricing and evaluation of division managers.
 To be announced Fall Qtr.
- 41.251 Intermediate Accounting** (Prereq. 41.113) 3 Cl.; 3 Q.H.
 The emphasis is on accounting theory and concepts together with an analysis of the special problems that arise in applying these concepts to financial accounting. Areas discussed include the basic accounting process, cash receivables, liabilities, and inventory valuation.
 Prof. Curran Fall and Winter Qtrs.
- 41.252 Intermediate Accounting** (Prereq. 41.251) 3 Cl.; 3 Q.H.
 This is a continuation of the discussion of the traditional structure of accounting theory and is underlying issues together with an evaluation of the conflicts and shortcomings in accounting concepts. Areas discussed include investment in productive resources and accounting for corporations.
 Prof. Curran Spring and Summer Qtrs.
- 41.253 Cost Accounting** (Prereq. 41.113) 3 Cl.; 3 Q.H.
 The accumulation of cost data for managerial analysis and control; process cost accounting and the costing of by-products and joint products.
 Prof. Malchman Fall and Winter Qtrs.
- 41.254 Cost Accounting** (Prereq. 41.253) 3 Cl.; 3 Q.H.
 Estimated cost systems; budgetary control with standard costs; the cost and profit analyses for decision-making purposes.
 Prof. Malchman Spring and Summer Qtrs.
- 41.255 Advanced Accounting** (Prereq. 41.252) 4 Cl.; 4 Q.H.
 Varied accounting systems including partnerships, home and branch, parent and subsidiary; foreign exchange.
 Mr. DuBois Fall and Winter Qtrs.
- 41.256 Advanced Accounting** (Prereq. 41.255) 4 Cl.; 4 Q.H.
 Specialized accounting areas including consignment and instalment sales, receivership, municipal and institutional accounting; estate and trust accounting; taxation and planning.
 Mr. DuBois Spring and Summer Qtrs.

- 41.257 Auditing** (Prereq. 41.252) 4 Cl.; 4 Q.H.
 Designed to give the Accounting major a thorough knowledge of auditing through the application of auditing principles and adherence to auditing standards; the ethics of the profession together with the impact of new and advanced audit techniques.
 Prof. Richards Spring and Summer Qtrs.
- 41.259 Seminar** 4 Cl.; 4 Q.H.
 The seminar consists of discussion and reports on selected topics in accounting literature.
 Prof. Slavin Fall and Winter Qtrs.
- 41.260 Taxes** 4 Cl.; 4 Q.H.
 Basic federal taxation as it applies to individuals, partnerships, and corporations.
 Prof. Burnham Spring Qtr.
- 41.261 Role of Accounting in Decision Making** (Prereq. 41.256) 4 Cl.; 4 Q.H.
 A study of business problems and the role accounting can and should play in their solution.
 Prof. Lindhe Fall and Winter Qtrs.

Marketing

- 43.120 Marketing Fundamentals** 3 Cl.; 3 Q.H.
 The planning and operating of marketing programs, with emphasis upon effective use of available methods and facilities.
 Prof. Dufton and Staff Fall and Winter Qtrs.
- 43.121 Marketing Dynamics** (Prereq. 43.120) 3 Cl.; 3 Q.H.
 The dynamics of product innovation and adaptation of marketing strategy to changes in consumer tastes, buying habits, and competitive forces—for both consumer and industrial goods.
 Prof. Dufton and Staff Spring and Summer Qtrs.
- 43.220 Marketing Policies and Problems** 4 Cl.; 4 Q.H.
 For non-Marketing majors. Management's analytical approach in a variety of firms to product planning, channels of distribution, advertising, personal selling, sales promotion, pricing, and marketing research.
 Prof. Minichiello Fall and Winter Qtrs.
- 43.221 Current Issues in Marketing** 4 Cl.; 4 Q.H.
 For non-Marketing majors. Reading, discussion, and analysis of current and controversial topics in domestic and international marketing.
 To be announced Spring and Summer Qtrs.
- 43.230 Marketing Operations I** (Prereq. 43.121) 3 Cl.; 3 Q.H.
 Such diverse disciplines as managerial economics, quantitative analysis, and the behavioral sciences are examined as sources of analytical and research tools for effective marketing operations.
 Prof. Collazzo Fall and Winter Qtrs.

- 43.231 Marketing Operations II** (Prereq. 43.230) 3 Cl.; 3 Q.H.
A continuation of 43.230, with emphasis upon the application of such analytical and research tools to achievement of effective and efficient marketing operations.
Prof. Collazzo Spring and Summer Qtrs.
- 43.232 Advertising Techniques** (Prereq. 43.121) 3 Cl.; 3 Q.H.
The methods and mechanical processes used to produce advertisements, including television and radio commercials.
To be announced Fall and Winter Qtrs.
- 43.233 Retail Management** (Prereq. 43.121) 3 Cl.; 3 Q.H.
From a marketing management point of view, the activities and contributions of major retailing institutions, including department and specialty stores, supermarkets, and discount outlets.
Prof. Minichiello Spring and Summer Qtrs.
- 43.234 Marketing Case Analysis** (Prereq. 43.121) 3 Cl.; 4 Q.H.
Oral and written analysis of marketing case studies selected to develop skills in both qualitative and quantitative techniques of decision making.
Prof. Dufton Fall and Winter Qtrs.
- 43.240 Marketing Research I** (Prereq. 43.121) 4 Cl.; 4 Q.H.
The application of theoretical knowledge and research methodology to marketing, with emphasis upon quantitative methods and behavioral science concepts.
Prof. Zif Fall and Winter Qtrs.
- 43.241 Marketing Research II** (Prereq. 43.240) 4 Cl.; 4 Q.H.
Operation and interpretation of marketing research studies with applications to problems in advertising product policy, sales, pricing, and motivational research.
Prof. Zif Spring and Summer Qtrs.
- 43.242 Sales Management** (Prereq. 43.121) 4 Cl.; 4 Q.H.
Creation, management, and appraisal of the sales force. Case studies and discussions, plus selected readings.
Prof. Finger Fall and Winter Qtrs.
- 43.243 Advertising Management** (Prereq. 43.121) 4 Cl.; 4 Q.H.
A study of advertising management through class discussions of case studies selected to illustrate means of achieving proper balance and coordination of advertising with other elements in the marketing mix.
Prof. Jenkins Spring and Summer Qtrs.
- 43.250 Marketing Management I** (Prereq. 43.121) 4 Cl.; 4 Q.H.
The decision-making and managerial aspects of selected marketing programs analyzed through use of case studies that relate to both consumer and industrial goods.
Profs. Jenkins and Minichiello Fall and Winter Qtrs.

- 43.251 Marketing Management II** (Prereq. 43.250) 4 Cl.; 4 Q.H.
A continuation of 43.250, with increased opportunity for student participation in verbal and written analyses of the selected case studies.
Prof. Minichiello Spring Qtr.
- 43.260 Industrial Marketing** 4 Cl.; 4 Q.H.
The marketing of products where business firms are the potential customers. For Marketing and non-Marketing majors.
Prof. Morrison Spring Qtr.
- 43.261 International Marketing** 4 Cl.; 4 Q.H.
The opportunities, methods, and policies in management of international marketing programs. For Marketing and non-Marketing majors.
Prof. Dufton Fall and Winter Qtrs.
- 43.262 Advertising Management** (Prereq. 43.231) 4 Cl.; 4 Q.H.
A study of advertising management through class discussions of case studies selected to illustrate means of achieving proper balance and coordination of advertising with other elements in the marketing mix.
Prof. Jenkins Spring and Summer Qtrs.
- 43.263 Retail Management** 3 Cl.; 3 Q.H.
From a marketing management point of view, the activities and contributions of major retailing institutions, including department and specialty stores, supermarkets and discount outlets.
Prof. Minichiello; Mr. Lasser Spring and Summer Qtrs.
- 43.270 Marketing Policy Seminar** 4 Cl.; 4 Q.H.
One half of the course is concerned with a limited number of case studies in the broad areas of marketing policy and management. The other half combines with the other college departments to give all students the benefit of applying the various functional approaches to specific cases in business administration and policy.
Prof. Morrison Fall and Winter Qtrs.
- 43.271 Marketing Theory Seminar** 4 Cl.; 4 Q.H.
In seminar-type discussions, an attempt is made toward a synthesis and analysis of marketing theory and practice. Course is based upon a list of reading selected from various sources and disciplines.
To be announced Spring Qtr.

Finance and Insurance

- 44.120 Introduction to Finance** 4 Cl.; 4 Q.H.
An introduction to the role of finance and insurance in the economic world; a survey of financial institutions and their functions; an analysis of the basic institutions and principles in risk and insurance.
Prof. Lovely and Staff Fall and Winter Qtrs.

- 44.121** (Prereq. 44.120) 4 Cl.; 4 Q.H.
 An extension of the institutional information developed in 44.120 to the business firm.
 Prof. Lovely and Staff Spring and Summer Qtrs.
- 44.150 Corporate Finance** (Prereq. 44.120) 3 Cl.; 3 Q.H.
 An analytical approach to the financial management of the business firm; stress on the importance of cash flow in analysis. The theory of the optimum return on optimum assets is developed under the goal of maximizing the owners' position. Theories of capital budgeting and cost of capital are further developed and applied against considerations of acquisition of both short term and long term assets. Internal sources of funds.
 Prof. Cossaboom Fall and Winter Qtrs.
- 44.152 Corporate Finance** (Prereq. 44.150) 3 Cl.; 3 Q.H.
 A continuation of the analysis of the financing of the firm with emphasis on capital structure and external sources of funds. Various means of financing are discussed both as to inherent advantage and disadvantage and also from the point of view of the effect of these means on the capital structure and cost of capital. Some time is devoted to the process of marketing and securities and the buyers of those securities.
 Prof. Cossaboom Spring and Summer Qtrs.
- 44.155 Corporate Finance** (Prereq. 44.121) 3 Cl.; 3 Q.H.
 A survey of the financial management of the business firm. Various means of financing and sources of funds are discussed. Capital budgeting and cash flow analysis are introduced.
 To be Announced All Qtrs.
- 44.240 Personal Finance** 4 Cl.; 4 Q.H.
 The concept of the total personal estate; budgeting, savings, insurance; investments and estate planning.
 Prof. Cossaboom Fall, Winter, and Spring Qtrs.
- 44.245 Credit Management** (Prereq. 44.152) 4 Cl.; 4 Q.H.
 A managerial approach to the matter of extension of credit and collection of receivables within the business firm; emphasis on the measurement of the risk involved, both individual and general; types of credit; evidences of debt; collateral and collateral documents; sources of credit information; evaluation of risk; collection procedures; rights of creditors.
 To be Announced Fall and Winter Qtrs.
- 44.250 Life Insurance** (Prereq. 44.120) 3 Cl.; 3 Q.H.
 Modern approaches to personal and business uses, including investment aspects of life insurance; types of contracts are analyzed from both the buyer's and the company's point of view. Legal concepts, the beneficiary clause and settlement options, including analysis of the life insurance contract, are discussed, supplemented by recent court cases. Types and organization of companies: investment policy; underwriting and marketing; risk management; and rate-making principles and techniques, including reserves and surrender values.
 Prof. Smith Spring and Summer Qtrs.

- 44.252 Property and Casualty Insurance** (Prereq. 44.250) 4 Cl.; 4 Q.H.
Initial emphasis on a thorough analysis of the fire insurance, automobile and general liability policies; case discussion; inland marine and selected casualty coverages; underwriting practices and problems; loss prevention and adjustment in property and casualty lines; a brief introduction to rate making; analysis of reserves and reinsurance, the homeowners contract, workmen's compensation, fidelity and surety bonds, and government regulation.
Prof. Smith Fall and Winter Qtrs.
- 44.255 Estate Planning** (Prereq. 44.250) 3 Cl.; 3Q.H.
The nature and process of estate planning, using illustrated cases, is described by evaluating impairments, forming the estate plan, and finally testing the designated plan. Wills, taxation, the marital deduction and life insurance explained in detail; forms of trusts, gifts, and joint ownership as tools available in estate plan.
To be Announced Spring and Summer Qtrs.
- 44.260 Financial Forecasting** (Prereq. 44.152) 4 Cl.; 4 Q.H.
The relation of forecasting techniques to the long-run goals of the firm. The interrelationship of the future of the company, the industry, and the economy.
Prof. Marple Fall and Winter Qtrs.
- 44.270 Investments** (Prereq. 44.152) 4 Cl.; 4 Q.H.
Investment goals and objectives; various types of investment compared; the role of the securities market.
To be Announced Fall and Winter Qtrs.
- 44.272 Security Analysis** (Prereq. 44.270) 4 Cl.; 4 Q.H.
The topic is broadly covered with attention given to the relationship between the economy and stock price averages. Methods of analyzing and appraising developments within the firm; the relation of earnings, dividends, and cash flow to the market valuation of a company's securities; portfolio analysis and planning.
Prof. Walle Spring Qtr.
- 44.275 Money and Capital Markets** (Prereq. 44.272) 4 Cl.; 4 Q.H.
The fundamentals of the nature, development and functioning of our financial system as crystalized in the money and capital markets; theory and applied theory.
Prof. Rugina Spring and Summer Qtrs.
- 44.280 Seminar in Finance and Insurance** (Prereq. 44.270) 4 Cl.; 4 Q.H.
One half of the course concerns case studies in the area of finance and insurance. The other half is integrated with the other college departments to give students the benefit of various approaches to specific cases in business administration.
Profs. Smith and Hehre Fall and Winter Qtrs.
- 44.281 Continuation of Departmental Seminar** (Prereq. 44.280) 4 Cl.; 4 Q.H.
Profs. Marple and Smith Spring Qtr.

Management

- 45.120 Introduction to Management and Organization** 3 Cl.; 3 Q.H.
 American business with emphasis on the fundamental concepts of management and the problems inherent in building and maintaining an effective organization.
 Profs. Keith, Gubellini and Staff Fall and Winter Qtrs.
- 45.121 Introduction to Personnel and Production** (Prereq. 45.120) 3 Cl.; 3 Q.H.
 An introduction to the personnel and production functions of business with emphasis on the fundamental problem areas and the development of techniques that may be employed by management to their solution.
 Profs. Keith, Gubellini and Staff Spring and Summer Qtrs.
- 45.209 Organizational Behavior** (Prereq. 45.120) 3 Cl.; 3 Q.H.
 A study of the behavior of people within the framework of the formal organization structure of business and other institutions.
 To be Announced Fall and Winter Qtrs.
- 45.113 Organizational Behavior** 3 Cl.; 3 Q.H.
 Continuation of 45.209.
 To be Announced Spring and Summer Qtrs.
- 45.255 Personnel Management** (Prereq. 45.121) 4 Cl.; 4 Q.H.
 The problems of management's relations with employees. Topics include: essentials of personnel policy, organizing and manning of work teams, administration of performance standards, and wage and salary administration.
 Profs. Higgins and Otlewski Fall and Winter Qtrs.
- 45.256 Industrial Relations** (Prereq. 45.255) 4 Cl.; 4 Q.H.
 The broader aspects of work relationships. Topics covered include: the social impact of wages, the impact of automation, manpower utilization, and unemployment.
 Profs. Higgins and Otlewski Spring and Summer Qtrs.
- 45.265 Production Management** (Prereq. 45.121) 4 Cl.; 4 Q.H.
 The management of manufacturing activities. Topics include: product design; methods study; layout, inventory and production control; production standards; control of quality. Statistical techniques are emphasized.
 Profs. Mullins and Phillips Fall and Winter Qtrs.
- 45.266 Production Management** (Prereq. 45.265) 4 Cl.; 4 Q.H.
 A continuation of 45.265.
 Profs. Mullins and Phillips Spring and Summer Qtrs.
- 45.270 Senior Seminar** 4 Cl.; 4 Q.H.
 In seminar type discussions, one half of the course emphasizes the development of management and organization theory. The other half is integrated with other departments of the college to give students the benefits of various analytical approaches to specific cases in business administration.
 Profs. MacDonald, Samaras, Rochwarg Fall and Winter Qtrs.

- 45.271 Seminar in Management** (Prereq. 45.270) 4 Cl.; 4 Q.H.
 The changing nature of the manager's job. Through cases and readings the student develops a picture of the environment within which tomorrow's managers will operate and the nature of the new tasks involved.
 Profs. MacDonald, Samaras, Rochwarg Spring Qtr.

- 45.275 Labor Law** (Prereq. 45.256) 4 Cl.; 4 Q.H.
 The changing judicial principles and statutory standards of employment and management-union relations since 1800.
 Prof. Myers Fall and Winter Qtrs.

- 45.276 Seminar in Collective Bargaining** (Prereq. 45.275) 4 Cl.; 4 Q.H.
 Cases or reports on problems faced by industrial relations departments dealing with employees through collective bargaining; individual research.
 Prof. Myers Spring Qtr.

Business General

- 49.155 Legal Aspects of Business** 4 Cl.; 4 Q.H.
 The legal aspects of business transactions and business relationships involving contracts, agency, negotiable instruments, suretyship and guaranty.
 Profs. Fiumara, Scioletti All Qtrs.

- 49.205 Introduction to Data Processing** (Prereq. 45.121) 3 Cl.; 3 Q.H.
 Manual, mechanical, and electronic methods of data processing; emphasis on computerized systems, flow charting techniques, and equipment capabilities and limitations.
 To be Announced Fall and Winter Qtrs.

- 49.206 Management Information Systems** 3 Cl.; 3 Q.H.
 Design, development, and implementation of integrated business systems. The topics of determining management requirements, value and cost of information, and computer feasibility are explored through cases and readings.
 Profs. Gubellini, Rochwarg Spring and Summer Qtrs.

- 49.210 Legal Aspects of Business Organization** (Prereq. 45.155) 4 Cl.; 4 Q.H.
 The legal aspects of the typical forms of business ownership; the law of sales transactions in business.
 Prof. Fiumara Fall, Winter and Spring Qtrs.

- 49.240 Law in Society** 4 Cl.; 4 Q.H.
 This course will acquaint the student, as a member of society, with his legal rights, obligations and responsibilities, applicable in his relationship with others and with the state.
 Prof. Fiumara Spring Qtr.

49.250 Statistics

(Prereq. 39.106) 4 Cl.; 4 Q.H.

This course builds from a base of descriptive statistics (control tendency, dispersion, grouped and ungrouped data, etc.) toward an introductory level of statistical inference (sampling, probability, expected value, probability distributions and statistical estimation); emphasis on business decision-making under uncertainty and on the key role of probability theory which enables us to use sampling data to estimate unknown parameters with measurable risk of error.

Prof. Keith

Fall and Winter Qtrs.

49.250 Statistics

(Prereq. 39.250) 4 Cl.; 4 Q.H.

Continuation of investigation of decision-making under uncertainty; continuation in field of statistical inference with hypothesis testing, quality control charts, regression-correlation analysis, and time series analysis.

Prof. Keith

Spring and Summer Qtrs.

49.258 Accounting Systems and Data Processing (Prereq. 41.252) 4 Cl.; 4 Q.H.

Business information systems and problems; automated data processing systems and applications; digital computer concepts; program languages; the use of flow-charting techniques. These concepts will be applied to assist the student to analyze and improve accounting systems.

Prof. Nielson

Fall and Winter Qtrs.

Education Foundations

50.111 Social Science I

3 Cl.; 3 Q.H.

Cultural Anthropology and Education. Theories and concepts in cultural anthropology will be studied with primary emphasis on their relevance to informal and formal aspects of educational processes. Considerable attention will be devoted to the study of cross cultural materials in order to understand the educational process in different cultural milieus.

Prof. Durham in charge

Fall Qtr.

50.112 Social Science II

3 Cl.; 3 Q.H.

Sociology and Education. The course involves sociological analysis of the educational enterprise in the United States and other technologically advanced societies, including consideration of the socialization process, the formation of youth cultures, and the function of the schools in these contexts. Attention will be given to the study of the effects of stratification, ethnic, and racial factors on educational institutions, education and social change, and the school as a social system.

Prof. Durham in charge

Winter Qtr.

50.113 Social Science III

3 Cl.; 3 Q.H.

Intergroup Relations and Education. Examination of theoretical and empirical materials relative to the problem of intergroup relations and prejudice. Particular attention will be paid to the role of education in the reduction of intergroup conflict.

Prof. Durham in charge

Spring Qtr.

- 50.121 Human Development and Learning I** 4 Cl.; 4 Q.H.
Developmental processes from prenatal life up to adolescence; theories of learning and personality, with research and case material covering major aspects of psychological development.
Prof. Nichols in charge All Qtrs.
- 50.131 Human Development and Learning II** (Prereq. 50.121) 4 Cl.; 4 Q.H.
Continuation of Human Development and Learning I. Significant aspects of adolescence; physical, social, and psychological factors as they influence adolescent behavior.
Prof. Gulo in charge Fall and Winter Qtrs.
- 50.141 Measurement and Evaluation**
(Prereq. Meth. and Mat. course in maj. field) 4 Cl.; 4 Q.H.
The fundamentals of measurement; basic statistical concepts and techniques used; evaluation of standardized and teacher-made tests.
Prof. Gulo in charge Spring and Summer Qtrs.
- 50.151 Backgrounds of American Education** (Prereq. 50.141) 4 Cl.; 4 Q.H.
Historical and philosophical foundations of American education beginning with old-world origins; development of American schools and educational thought from the colonial period to the present with emphasis on major current issues in education.
Prof. Harmon in charge Fall, Winter and Spring Qtrs.

Education—Instruction

- 51.124 Modern Mathematics Curricula** 4 Cl.; 4 Q.H.
Mathematics curricula in junior and senior high schools, including experimental programs, presented in their historical setting.
Prof. Clark Spring Qtr.
- 51.131 Fundamentals of Arithmetic I** 4 Cl.; 4 Q.H.
Techniques of teaching arithmetic so that underlying principles are stressed. Topics are selected to serve as a foundation in mathematics appropriate for any elementary program. Topics considered are: deductive and inductive reasoning, numeration systems, elementary concepts of set theory, whole numbers and rational numbers and their properties, decimal numerals, linear equations and inequalities.
Prof. Clark Fall and Winter Qtrs.
- 51.132 Fundamentals of Arithmetic II** (Prereq. 51.131) 4 Cl.; 4 Q.H.
Continuation of Fundamentals of Arithmetic I. Topics considered are: rate, ratio and percent, informal geometry, elementary theorems and proofs, similarity and trigonometry, area of volume, elements of spherical geometry.
Prof. Clark Spring and Summer Qtrs.

51.135 Analysis of Teaching and Educational Process

(Prereq. 50.131) 4 Cl.; 4 Q.H.

The relationships that exist between instructional objectives and teaching behavior; applications of human development and learning concepts as they relate to subsequent specialized teaching methods and materials. Research results and promising theory are used to extend the prospective teacher's concepts of the teaching function.

Prof. Rochfort in charge

Spring and Summer Qtrs.

51.140 Methods and Materials for Teaching Modern Languages

(Prereq. 51.135) 4 Cl.; 4 Q.H.

The most effective types of classroom activities, subject unit organization, assignments, examinations, and teaching aids used in modern language; the role of the language laboratory with its problems of selecting equipment, scheduling pupils, planning tapes and content of drill exercises, evaluating results and coordinating its functions with conventional classroom instruction.

Prof. Petralia

Fall and Winter Qtrs.

51.141 Elementary Education Compendium I (Prereq. 51.135) 4 Cl.; 4 Q.H.

The curriculum is analyzed on the basis of the overall objectives of the American elementary school. Students evaluate and organize units of work which are appropriate to the level at which they plan to teach. The integrated approach to learning is emphasized, but the integrated approach to science, social studies and language arts subjects are given special attention.

Prof. Lee in charge

Fall and Winter Qtrs.

51.142 Elementary Education Compendium II (Prereq. 51.141) 4 Cl.; 4 Q.H.

The objectives, activities, and methods of evaluation in the elementary school are continued with special attention to the areas of music, art and physical education.

Prof. Lee in charge

Spring and Summer Qtrs.

51.143 Methods and Materials of Teaching English

(Prereq. 51.135) 4 Cl.; 4 Q.H.

An introduction to the structure and functions of language as they apply to the teaching of English; curriculum and planning in English; the unit approach; specific techniques of teaching reading and literature, grammar and usage, written and oral composition, listening, spelling, vocabulary, and the use of mass media.

To be Announced

Fall and Winter Qtrs.

51.145 Methods and Materials of Teaching Mathematics

(Prereq. 51.135) 4 Cl.; 4 Q.H.

Theory and practice of teaching secondary mathematics, including a discussion and evaluation of instructional problems. Lesson planning and presentations by individual students will afford appropriate practice and serve as the medium of instruction.

Prof. McLean

Fall and Winter Qtrs.

51.147 Methods and Materials of Teaching the Sciences

(Prereq. 51.135) 4 Cl.; 4 Q.H.

The prospective science teacher is introduced to the following: the philosophies of science and their applicability in society and the secondary school; science curriculum development and application; and pertinent methods and materials in science education.

Prof. Miner

Fall and Winter Qtrs.

51.149 Methods and Materials of Teaching Social Studies

(Prereq. 51.135) 4 Cl.; 4 Q.H.

A consideration of: the philosophical and utilitarian justifications for the teaching of social studies in the public schools; various research tools, indices, and bibliographies available in the social science disciplines; various teaching techniques as they relate to social studies education; current trends in social studies education; the critical evaluation of social issues; the techniques of planning; the relation of significant teaching objectives.

Prof. Tedesco

Fall and Winter Qtrs.

51.151 Student Teaching and Seminar

(Prereq. 50.141) 8 Q.H.

Opportunity for observation and teaching under regular supervision; carried on daily for full quarter with seminar running concurrently.

Prof. Haley in charge

Fall, Winter and Spring Qtrs.

Education — Reading

54.126 Teaching Reading in Secondary Schools

4 Cl.; 4 Q.H.

For English and Social Studies majors in the College of Education who are preparing for teaching in the junior or senior high schools. Basically the same approach and organization applies to this course as to the elementary level course. (one quarter)

Prof. Leeds

Spring and Summer Qtrs.

54.135 Fundamentals of Reading I

4 Cl.; 4 Q.H.

The basic, introductory course in developmental reading for prospective elementary teachers. In the first term the emphasis will be on language and symbolic process as it relates to beginning reading. The word recognition and meanings growth areas will be studied in detail, as will some methods and techniques of testing and grouping. An introduction to some reading books and materials, methods of teaching and the psychology of learning to read. Tutorial work will begin with students.

Prof. Werle in charge

Fall and Winter Qtrs.

54.136 Fundamentals of Reading II

(Prereq. 54.135) 4 Cl.; 4 Q.H.

A continuation and extension of the first term. Study skills; speed and fluency growth areas. The tutorial work will be extended. Greater familiarity with books, materials and methods will be achieved.

Prof. Werle in charge

Spring and Summer Qtrs.

- 54.141 Remedial Reading** (Prereq. 54.136)
 For prospective teachers in the primary unit. This introductory course familiarizes the student with some of the most commonly known and met reading problems in the typical classroom as well as in the reading clinic; analysis and evaluation of the typical diagnoses of such problems; corrective programs; tutorial work with a retarded reader, with each student keeping a log or journal of his work with a particular reading problem.
 Prof. Howards in charge Fall and Winter Qtrs.
- 54.142 Linguistics and Reading** (Prereq. 54.136) 4 Cl.; 4 Q.H.
 For elementary level teachers (primary unit). The major objective is to translate the knowledge gathered from structural and descriptive linguistics into useful classroom instruction, which includes not only reading instruction, but basic instruction in the related language skills. The contributions, particularly of writers like Fries, Barnhart, Bloomfield and LeFevre, will be analyzed and experimented with in a tutorial situation in order to derive from this approach its practical values for teaching.
 Prof. Howards in charge Spring and Summer Qtrs.
- 54.151 Children's Literature** (Prereq. 54.136) 4 Cl.; 4 Q.H.
 For prospective teachers in the primary unit. A comprehensive survey and critical analysis of the books and materials available for basic reading instruction and for supplementary reading activities. After a massive review of the available literature for the children, especially in grades K-3, each student will be responsible for developing some material of his own for trial with subjects. The ultimate goal is to make the student aware of what is available and how to use it most effectively in a reading program.
 Prof. Buffone Spring Qtr.

Education—Rehabilitation and Special

- 55.121 Introduction to Special Education** 4 Cl.; 4 Q.H.
 An introductory survey course which emphasizes the characteristics and needs of exceptional children and youth; recognition of exceptional children in the classroom, including: the trainable and educable retarded; emotionally disturbed; social offender; brain-injured; speech-, hearing-, and language-impaired; the physically handicapped; the visually handicapped; and the gifted.
 Prof. Ferullo Fall and Winter Qtrs.
- 55.122 Introduction to Speech and Hearing Therapy** 4 Cl.; 4 Q.H.
 Normal language and speech development in children. Analysis of the most prevalent organic and functional communication disorders, with emphasis on identification techniques. Lectures, demonstrations, and 15 clock hours of observation in University clinic.
 Prof. Ferullo Spring and Summer Qtrs.
- 55.124 Anatomy, Physiology, and Neurology of the Speech and Hearing Mechanism** 4 Cl.; 4 Q.H.
 Physiological and mechanical components of speech and hearing. The skeletal, muscular, and nervous systems. Lectures and laboratory demonstrations.
 Mrs. Aram Spring and Summer Qtrs.

55.126 Communication Skills for the Teacher

4 Cl.; 4 Q.H.

The importance of effective communication in the teaching profession. Utilization of the knowledge of the scientific principles of voice production with practice of effective vocal usage. Integration of communication skills with regular classroom curriculum. Lectures, exercises, demonstration, and observations.

Prof. Ferullo

Spring and Summer Qtrs.

55.131 Development of Language and Speech

(Prereq. 55.122) 4 Cl.; 4 Q.H.

Analysis of theories related to concept formation, development and utilization of symbols from birth to maturation. Foundations and developmental phases of language and speech. The significance of physiological, neurological, psychological, and intellectual factors affecting language and speech development. Case studies, lectures, demonstration, and observations.

Mr. Neil

Fall and Winter Qtrs.

55.133 Introduction to Linguistics and Phonetics

(Prereq. 55.122) 4 Cl.; 4 Q.H.

Learning and applying the International Phonetic Alphabet. A consideration of articulated phonemes and allophones, sound change, structural and descriptive linguistics applied to problems in communication. The nature of language. Lectures, demonstrations, and observations.

Miss Rosoff

Fall and Winter Qtrs.

55.134 Organic Speech Disorders

(Prereq. 55.124) 4 Cl.; 4 Q.H.

Etiology, diagnosis, and prognosis of non-neurological communication disorders; consideration of therapeutic procedures in cleft-palate and cleft-lip, and related maxillo-facial abnormalities; laryngectomy; and tongue-thrusting. Lectures, observations, and demonstrations.

Mr. Neil

Spring and Summer Qtrs.

55.141 Methods and Materials in Speech and Hearing

(Prereq. 51.135) 4 Cl.; 4 Q.H.

Various materials and methods used in the correction of speech problems. The rationale of the corrective process; selection, preparation, and presentation of materials. Speech correction and improvement through an integrated approach.

To be announced

Fall and Winter Qtrs.

55.142 Introduction to Audiology

(Prereq. 55.124; 4 Cl.; 4 Q.H.)

The physics of sound, anatomy, physiology, and neurology of the ear. Basic techniques in audiometric testing. Lectures, demonstrations, and observations.

To be announced

Spring and Summer Qtrs.

55.143 Diagnostic Techniques in Speech and Hearing

(Prereq. 55.134) 4 Cl.; 4 Q.H.

disorders. Demonstrations, case histories, and experience in University tests utilized in evaluation of individuals with language, speech, and hearing disorders. Demonstrations, case histories, and experience in University clinic.

To be announced

Fall and Winter Qtrs.

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55.144 Clinical Practice in Speech and Hearing I

(Prereq. 55.131, 55.133) 2 Cl.; 6 (clinic) Lab.; 4 Q.H.

Practicum in language, speech, and hearing diagnosis and therapy in University clinic. Students should reserve a block of hours for clinic practicum. A minimum of 100 clock hours.

Prof. Ferullo

Spring and Summer Qtrs.

55.145 Functional Speech Disorders

(Prereq. 55.124) 4 Cl.; 4 Q.H.

Etiology, diagnosis, and prognosis of communication disorders of non-organic origins. Language and speech disorders and the psychodynamics of personality development. Lectures and demonstrations, case histories, and experience in the University clinic.

To be announced

Fall and Winter Qtrs.

55.152 Speechreading and Auditory Training

Various speechreading methods; an integrated approach to the treatment of hard-of-hearing individuals; auditory training techniques and materials.

Offered 1969–70

55.154 Introduction to Stuttering

(Prereq. 55.145) 4 Cl.; 4 Q.H.

A consideration of some of the major theories of stuttering. Diagnosis and therapy procedures. Lectures, demonstrations, and observations.

Offered 1969–70

55.155 Clinical Practice in Speech and Hearing II

(Prereq. 55.144 and 100 in University clinic) 2 Cl.; 6 (clinic) Lab.; 4 Q.H.

Practicum in language, speech, and hearing diagnosis in a medical and/or rehabilitation center; a multidisciplinary approach in the treatment of children and adults.

Offered 1969–70

Physical Education — Women General University Instructional Program

60.101 Physical Education Activity

2 Lab.; 1 Q.H.

Students must complete two terms of physical education activities selected from the areas of team, individual, or dual sports, gymnastics, dance, aquatics, basic motor skills. Selection will be made in terms of student's interest and ability. Required for all university women not majoring in Physical Education.

Prof. Nicholson and Staff

All Qtrs.

60.102 Physical Education Activity

2 Lab.; 1 Q.H.

Same as above.

Prof. Nicholson and Staff

All Qtrs.

Professional Program*

60.121 Physical Education Skills I

1 Cl.; 3 Lab.; 2 Q.H.

Development of knowledges and skills necessary for competent performance in areas of hockey and soccer-speedball.

Miss Shaw and Miss Cairns

Fall Qtr.

- 60.122 Physical Education Skills II** 2 Cl.; 4 Lab.; 3 Q.H.
Development of knowledges and skills necessary for competent performance in areas of basketball, volleyball, posture, and rhythmic analysis.
Prof. Nicholson and Staff Winter Qtr.
- 60.123 Physical Education Skills III** 2 Cl.; 4 Lab.; 3 Q.H.
Development of knowledges and skills necessary for competent performance in areas of modern dance, swimming and diving, and lacrosse.
Miss Shaw and Staff Spring Qtr.
- 60.125 Camp Leadership and Outdoor Education I** 4 Q.H.
A three-week resident session at the Warren Center. Emphasizes knowledge and personal skill development in several phases of camping, conservation, and outdoor education, including introduction to counselor education.
Prof. Luttgens and Staff Summer Qtr.
- 60.126 Physical Education Skills A** 2 Cl.; 2 Lab.; 2 Q.H.
Development of knowledge and skills necessary for competent performance in selected activities. Open only to transfer students.
Staff All Qtrs.
- 60.127 Physical Education Skills B** 2 Cl.; 2 Lab.; 2 Q.H.
Continuation of 60.126.
Staff All Qtrs.
- 60.131 Physical Education Skills IV** 2 Cl.; 4 Lab.; 3 Q.H.
Development of knowledges and skills necessary for competent performance in areas of gymnastics, folk, square and social dance, and life saving skills.
Miss Knight and Staff Fall and Winter Qtrs.
- 60.132 Physical Education Skills V** 2 Cl.; 4 Lab.; 3 Q.H.
Development of knowledges and skills necessary for competent performance in areas of racquet sports, and track and field.
Miss Knight and Staff Spring and Summer Qtrs.
- 60.135 Camp Leadership and Outdoor Education II** 4 Q.H.
A three-week resident session at the Warren Center. Development of teaching proficiency in several phases of camping and outdoor education. Continued study of camp leadership, counselor education, conservation, and school camping.
Prof. Luttgens and Staff Summer Qtr.
- 60.140 Analysis and Teaching of Physical Activities I**
(Prereq. 60.122, 60.123, 60.131) 2 Cl.; 4 Lab.; 3 Q.H.
Analysis of performance and methods of teaching in the areas of dance and aquatics.
Miss Roberts and Miss Leathem Fall Qtr.
- 60.141 Analysis and Teaching of Physical Activities II**
(Prereq. 60.121, 60.122, 60.131) 2 Cl.; 4 Lab.; 3 Q.H.
Analysis of performance and methods of teaching in the areas of team sports (indoor) and gymnastics.
Prof. Rowlands and Miss Leathem Winter Qtr.

60.142 Analysis and Teaching of Physical Activity III

(Prereq. 60.121, 60.123, 60.132) 2 Cl.; 4 Lab.; 3 Q.H.

Analysis of performance and methods of teaching in the areas of field sports and racquet sports.

Miss Knight and Miss Shaw

Spring Qtr.

60.143 Winter Sports

1 Q.H.

Five-day resident session at North Conway, N.H. Participation according to ability in classes of Hannes Schneider Ski School. Evening seminars in skiing theory and teaching methods.

Miss Leathem

Winter Qtr.

60.150 Human Anatomy I

2 Cl.; 3 Lab.; 3 Q.H.

Gross anatomy of the bones, joints and muscles of the human body, emphasis on practical application in relation to student's work in physical education.

Miss Cairns

Winter Qtr.

60.151 Human Anatomy II

(Prereq. 60.150) 3 Cl.; 3 Q.H.

The gross anatomy of the human body exclusive of the bone, joint and muscle systems.

Miss Bretschneider

Spring Qtr.

60.160 Instructional Technology

2 Cl.; 2 Q.H.

Survey of selection, evaluation, preparation, and production of audio-visual media, instructional television and programmed learning. Some opportunity to work with related equipment.

Prof. Gilbert and Staff

Fall Qtr.

60.220 Program and Methods in Elementary School Physical Education Activities

(Prereq. 19.102, 50.121, 50.131) 4 Cl.; 4 Q.H.

Philosophy, program planning, and methods for teaching children; guided observation experiences with children in schools; individual teaching presentations and evaluations in basic motor skills, dance activities, games, gymnastics, and sports.

Miss Leathem

Winter Qtr.

60.230 Advanced Teaching and Analysis

(Prereq. 60.140, 60.141, 60.142) 2 Cl.; 4 Lab.; 3 Q.H.

Advanced study of teaching methods and analysis in *one* of areas studied in Physical Education 60.140-142 and *one* individual sport.

Prof. Rowlands and Staff

Winter and Spring Qtrs.

60.261 Curriculum Building and Trends

3 Cl.; 3 Q.H.

Basic foundations of curriculum development, stressing fundamental principles and guides to curriculum organization and improvement; emphasis on transmission of knowledge, learning, and values in the natural and cultural environment.

Miss Leathem

Spring Qtr.

60.280 Supervised Teaching

(Prereq. P.E. Curr. in sequence) 12 Q.H.

Observation and teaching at the elementary and secondary school levels;

development of understandings of school and community; conduct of classes and extraclass activities. Emphasis on continuity of units, lessons, and daily evaluations; supervision by cooperating school and Boston-Bouvé College faculty; individual conferences and group seminars.

Miss Leathem and Staff

Fall Qtr.

60.290 Special Problems

(Prereq. by permission) 3 Q.H.

Individual research or independent study related to some phase of physical education. Open only to students selected by department faculty on basis of proven ability.

Prof. Luttgens and Staff

Spring Qtr.

*Unless otherwise indicated, all courses listed are required for women students majoring in Physical Education.

Physical Education—Men

61.100 Basic Physical Education

2 Lab.; 1 Q.H.

The role of physical activity in daily living as based on the physiological, psychological and sociological needs of man; instruction and participation of an individualized nature.

All Qtrs.

61.110 Beginning Swimming

2 Lab.; 1 Q.H.

Instruction in the elementary techniques of swimming; emphasis on fundamental skills and safely procedures.

All Qtrs.

61.111 Intermediate Swimming

(Prereq. 61.110 or permission) 2 Lab.; 1 Q.H.

Instruction in the basic swimming strokes; emphasis on form, techniques, endurance.

All Qtrs.

61.113 Senior Life Saving

(Prereq. 61.112 or permission) 3 Lab.; 1 Q.H.

Development of advanced skill in life saving theory and techniques; Red Cross senior life saving certification possible.

All Qtrs.

61.125 Introduction to Gymnastics

2 Lab.; 1 Q.H.

Instruction in the elementary techniques of tumbling, free exercise, apparatus, and trampoline.

All Qtrs.

61.126 Tumbling

(Prereq. 61.125 or permission) 2 Lab.; 1 Q.H.

Intermediate and advanced instruction in tumbling and free exercise.

All Qtrs.

61.127 Apparatus

(Prereq. 61.125 or permission) 2 Lab.; 1 Q.H.

Intermediate and advanced instruction on apparatus and trampoline.

All Qtrs.

61.133 Badminton

2 Lab.; 1 Q.H.

Instruction in badminton at the elementary and intermediate levels.

All Qtrs.

61.141 Track and Field

2 Lab.; 1 Q.H.

Instruction in track, field, and cross country at the elementary and intermediate levels.

All Qtrs.

61.143 Weight Training

2 Lab.; 1 Q.H.

Introduction to the principles and use of resistive exercises; isotonic exercise (weights), isometric, and the appropriateness of each.

All Qtrs.

- 61.147 Bowling** 2 Lab.; 1 Q.H.
Beginning and intermediate instruction in bowling. Scoring, calculating handicaps, etiquette, terminology, selecting equipment, rules. All Qtrs.
- 61.165 Ballroom Dancing** 2 Lab.; 1 Q.H.
Instruction in the foxtrot, waltz, and polka; emphasis on elementary technique and procedure. All Qtrs.
- 61.175 Basketball** 2 Lab.; 1 Q.H.
Instruction in basketball at the intermediate level; emphasis on offensive and defensive individual and team play. All Qtrs.
- 61.176 Flag Football** 2 Lab.; 1 Q.H.
Instruction in flag football at the elementary and intermediate levels; emphasis on offensive and defensive individual and team play. All Qtrs.
- 61.177 Soccer** 2 Lab.; 1 Q.H.
Instruction in soccer at the elementary and intermediate levels; emphasis on offensive and defensive individual and team play. All Qtrs.
- 61.178 Softball** 2 Lab.; 1 Q.H.
Instruction in softball at the intermediate level; emphasis on offensive and defensive skills, rules, modification, value as a recreational activity. All Qtrs.
- 61.179 Volleyball** 2 Lab.; 1 Q.H.
Instruction in volleyball at the elementary and intermediate levels; emphasis on its value as a recreational activity; individual and team play, variations of play, scoring. All Qtrs.
- 61.185 Personal Defense** 2 Lab.; 1 Q.H.
Instruction in techniques of self-defense against armed or unarmed assailant; legal involvement. All Qtrs.
- 61.186 Boxing** 2 Lab.; 1 Q.H.
Instruction in boxing at the elementary and intermediate levels; emphasis on offensive and defensive techniques, training, scoring, officiating. All Qtrs.
- 61.187 Wrestling** 2 Lab., 1 Q.H.
Instructions in wrestling at the elementary and intermediate levels; emphasis on offensive and defensive techniques, scoring, training, officiating. All Qtrs.
- 61.200 Aquatics I** (Prereq. 61.100 or permission) 1 Cl.; 3 Lab.; 2 Q.H.
Instruction in beginning, intermediate, and advanced swimming skills with emphasis on the development of teaching methods and techniques.
Staff Fall and Winter Qtrs.
- 61.201 Aquatics II** (Prereq. 61.200 or permission) 1 Cl.; 3 Lab.; 2 Q.H.
skills. Special emphasis on officiating and meet organization.
Staff Spring and Summer Qtrs.

- 61.205 Gymnastics I** (Prereq. 61.125 or permission) 1 Cl.; 2 Lab.; 2 Q.H.
Intermediate and advanced skills in stunts and tumbling, apparatus, and free exercise; special emphasis on instructional techniques, safety, and the Staff
conducting of exhibitions and meets.
Mr. Gillespie Fall and Winter Qtrs.
- 61.210 Elementary School Activities** 3 Lab.; 1 Q.H.
Activities appropriate to the elementary school level; special emphasis on movement, games of low organization, dance, self-testing activities.
Prof. Curtin Winter Qtr.
- 61.212 Handball and Squash** 3 Lab.; 1 Q.H.
The skills and techniques involved in the teaching of handball and squash; special emphasis on skills involved, rules, courtesies and strategies in each sport.
Prof. Walker Fall and Winter Qtrs.
- 61.220 Survey of Recreational Sports** 3 Lab.; 1 Q.H.
Introduction to such recreational activities as archery, deck tennis, table tennis, horseshoes; emphasis on rules, teaching techniques, place in the program.
Prof. Curtin Spring and Summer Qtrs.
- 61.221 Volleyball and Badminton** 3 Lab.; 1 Q.H.
The theory and teaching of volleyball and badminton; special emphasis on rules, court and game courtesies, and strategies.
Prof. Goheen Spring and Summer Qtrs.
- 61.230 Secondary School Dance** 3 Lab.; 1 Q.H.
The techniques of dance instruction at the junior and senior high school levels.
Profs. Curtin and Larson Spring and Summer Qtrs.
- 61.235 Team Sports I** 1 Cl.; 2 Lab.; 2 Q.H.
The coaching of basketball and baseball to beginners; emphasis on role of head coach and assistant coach; organizing practice; the basic fundamentals of individual and team play.
Profs. Goheen and Curtin Fall and Winter Qtrs.
- 61.236 Team Sports II** 1 Cl.; 2 Lab.; 2 Q.H.
The coaching of football and track to beginners; role of head coach and assistant coach; organizing practice; the basic fundamentals of individual and team play.
Profs. Walker and Christensen Fall and Winter Qtrs.
- 61.237 Team Sports III** 3 Lab.; 1 Q.H.
Techniques of teaching soccer, speedball and softball; special emphasis placed on rules, courtesies and strategies.
Prof. Walker Spring and Summer Qtrs.

61.240 Introduction to Combatives

3 Lab.; 1 Q.H.

The basic fundamentals, techniques, rules, and strategy in such combative activities as boxing, wrestling, judo and combative games.

Prof. Walker and Mr. Gillespie

Fall and Winters Qtrs.

61.241 Advanced Wrestling (Prereq. 61.240 or permission) 1 Cl.; 2 Lab.; 2 Q.H.

Advanced techniques in coaching wrestling at the senior high school and college levels; emphasis on fundamentals of a more advanced nature: care of athletes, officiating, conduct of meets.

Mr. Gillespie

Spring and Summer Qtrs.

61.242 Advanced Boxing (Prereq. 61.240 or permission) 1 Cl.; 2 Lab.; 2 Q.H.

Advanced techniques in coaching, boxing; emphasis on offensive and defensive techniques, rules, and officiating.

Prof. Walker

Spring and Summer Qtrs.

61.245 Survey of Winter Sports

1 Cl.; 4 Lab.; 3 Q.H.

Introduction to such activities as skiing, tobogganing, skating; emphasis on skills; teaching techniques, safety procedures.

Staff

Fall and Winter Qtrs.

61.250 Anatomy and Physiology

3 Cl.; 2 Lab.; 4 Q.H.

Gross anatomy and physiology of the human skeletal and muscular systems.

Prof. Larson

Fall and Winter Qtrs.

61.251 Anatomy and Physiology

(Prereq. 61.250 or permission) 3 Cl.; 2 Lab.; 4 Q.H.

Gross anatomy and physiology of the human nervous and circulatory systems.

Prof. Larson

Spring and Summer Qtrs.

61.252 Anatomy and Physiology

(Prereq. 61.251 or permission) 3 Cl.; 2 Lab.; 4 Q.H.

Gross anatomy and physiology of the human respiratory, digestive and urinary systems.

Prof. Larson

Fall and Winter Qtrs.

61.263 Methods and Materials in Physical Education

(Prereq. 62.210 or permission) 4 Cl.; 4 Q.H.

Methods and materials to be used in curriculum development, class management and teaching preparation for student teaching.

Prof. Zobel

Fall and Winter Qtrs.

61.265 Advanced Football (Prereq. 61.236 or permission) 2 Cl.; 2 Lab.; 3 Q.H.

Basic techniques in coaching football at the senior high school and college levels; emphasis on individual and team play; offensive and defensive systems; role of head and assistant coaches; scouting; use of teaching aids; team management.

Staff

Spring and Summer Qtrs.

61.266 Advanced Basketball

(Prereq. 61.235 or permission) 2 Cl.; 2 Lab.; 3 Q.H.

Basic techniques at the senior high school and college levels; emphasis on systems of offensive and defensive team play; scouting; use of teaching aids; team management.

Staff

Spring and Summer Qtrs.

61.267 Advanced Baseball (Prereq. 61.235 or permission) 2 Cl.; 2 Lab.; 3 Q.H.

Basic techniques in coaching baseball at the senior high school and college levels; emphasis on individual and team play; role of head and assistant coaches; team management.

Staff

Spring and Summer Qtrs.

61.268 Advanced Track (Prereq. 61.236 or permission) 2 Cl.; 2 Lab.; 3 Q.H.

Basic techniques of coaching track and field at the senior high school and college levels; emphasis on care and training of athletes; practice schedules; coaching techniques; conduct of meets.

Staff

Spring and Summer Qtrs.

61.280 Camp Leadership

1 Cl.; 3 Lab.; 2 Q.H.

Introduction to the procedures of organized camping and outdoor activities; emphasis placed on camp skills; equipment; counseling; trip leadership; laboratory experiences.

Profs. Goheen and Curtin

Spring and Summer Qtrs.

61.285 First Aid

1 Cl.; 2 Lab.; 2 Q.H.

First aid procedures recommended for the home, school and community; emphasis on practices endorsed by the American Red Cross.

Prof. Kassabian

Spring Qtr.

61.287 Athletic Training (Prereq. 61.285 or permission) 2 Cl.; 2 Lab.; 3 Q.H.

The training procedures in athletic programs; special emphasis on the prevention of athletic injuries; role of the trainer, athletic coach, and health services.

Prof. Kassabian

Spring and Summer Qtrs.

61.290 Student Teaching

12 Q.H.

Assignment to public school(s) for observation and practice teaching under the guidance of a cooperating teacher and a college superior. Association with the many duties assumed by physical education teachers including coaching and/or intramural organization and supervision.

Prof. Zobel and Staff

Fall and Winter Qtrs.

Physical Education—Men and Women

62.200 Professional Orientation to Physical Education

1 Cl.; 1 Q.H.

Introduction to the history, objectives, literature, and organizations of the profession of physical education; discussion of responsibilities and opportunities of professional personnel.

Profs. Curtin and Miss Leathem

Fall Qtr.

62.210 History and Principles of Physical Education

(Prereq. 62.200) 4 Cl.; 4 Q.H.

Preview of history of physical education; the place and function of physical education in education and society; identification of principles for development of sound programs.

Profs. Fox, Goheen, Luttgens, and Miss Knight Fall and Winter Qtrs.

62.253 Kinesiology (Prereq. 60.150, 60.151 and Physiology) 4 Cl.; 4 Q.H.

Science of human motion; anatomic, mechanical, and physiological principles as they relate to an understanding of skillful, efficient and purposeful human motion.

Profs. Christensen and Luttgens Fall and Spring Qtr.

62.254 Physiology of Exercise (Prereq. 62.253) 3 Cl.; 2 Lab.; 4 Q.H.

Study of the immediate and long-range effects of exercise upon the human body. Emphasis on the circulatory and respiratory systems, training, the scientific foundations of physical fitness; survey of related research.

Prof. Christensen Fall and Winter Qtrs.

62.255 Adapted Physical Education (Prereq. 62.254) 3 Cl.; 2 Lab.; 4 Q.H.

Examination techniques for recognition of atypical conditions; characteristics and problems of the atypical; selection and adaptation of physical activities to meet individual needs.

Profs. Goheen and Luttgens Fall, Winter and Spring Qtrs.

62.260 Measurement and Evaluation (Prereq. 62.210) 4 Cl.; 4 Q.H.

Construction, use, selection, and interpretation of evaluative tools applicable to physical education; elementary statistical methods.

Prof. Goheen and Miss Knight Fall and Winter Qtrs.

62.270 Administration of Physical Education (Prereq. 62.210) 4 Cl.; 4 Q.H.

The organization and administration of programs in physical education with emphasis on the elementary and secondary school program.

Profs. Fox and Rowlands Winter and Spring Qtrs.

Recreation Education

63.120 Professional Orientation to Recreation 1 Cl.; 1 Q.H.

Philosophy and scope of modern recreation and its role in society. Discussion of opportunities at home and abroad in school and community settings, in agencies, hospitals, institutions and industries. Focus on goals for American recreation.

Prof. Robinson Fall Qtr.

63.121 Recreation Skills I 6 Lab.; 2 Q.H.

Skill development and participation in the recreational activities: tumbling, volleyball, badminton and Red Cross swimming skills.

Miss Glancy and Staff Fall Qtr.

63.122 Recreation Skills II 1 Cl.; 6 Lab.; 3 Q.H.

Skill development and participation in gymnastics, folkdance, music analysis, song leading and instrumental accompaniment.

Miss Glancy and Staff Winter Qtr.

- 63.123 Recreation Skills III** 1 Cl.; 6 Lab.; 3 Q.H.
Development of leadership skill in social recreation activities: singing, folk-dance, games and party program planning including leadership experiences with groups. Counselor education — philosophy and leadership methods in camping. Red Cross lifesaving course.
Miss Glancy and Staff Spring Qtr.
- 63.125 Outdoor Education and Camp Leadership** 4 Q.H.
A three-week resident summer session in June at Warren Center: includes Natural Science, Aquatics, Overnight Camping, Indian lore, ACA Campcraft certification, leadership in camp special programs, outdoor sports, small-craft training, and arts and crafts.
Prof. McCay and Staff Summer Qtr.
- 63.126 Outdoor Education I** 3 Lab.; 1 Q.H.
Interpretation of natural science and ecology. Emphasis on the development of personal skills through laboratory, field trips, lectures, learning experiences in the out-of-doors.
Mr. Bemis and Staff Fall and Winter Qtrs.
- 63.127 Outdoor Education II** 3 Lab.; 1 Q.H.
Emphasis in developing understanding, interest and field biology skills for economy, conservation and recreation. Includes wildlife management, forestry, horticulture and animal husbandry.
Mr. Bemis and Staff Spring and Summer Qtrs.
- 63.128 Survey of Outdoor Recreation and Park Facilities** 3 Lab.; 1 Q.H.
Fundamental management and administration concepts for a wide variety of outdoor areas and facilities such as parks, beaches, ice rinks, Marinas and camps.
To be Announced Fall Qtr.
- 63.129 School Camping — Organization and Administration** 3 Lab.; 1 Q.H.
Administration and leadership in school outdoor education and conservation programs in the natural environment. Field trips and laboratory includes experience with school-age groups.
Miss Glancy and Staff Spring Qtr.
- 63.131 Techniques of Recreation Leadership** 1 Cl.; 6 Lab.; 3 Q.H.
Study and practical experience in a diversity of group programs and processes; i.e. workshops, committees, clubs, informal gatherings, recreational programs for school, camp and community; field trips.
Prof. Robinson Fall and Winter Qtrs.
- 63.132 Interagency Planning for Community Action** 3 Cl.; 3 Q.H.
A study of agencies and how they function (program and personnel); how agencies cooperate for interagency programming. Legal and financial aspects and their effect on program.
Prof. Robinson Spring and Summer Qtrs.

- 63.133 Recreation Skills IV** 6 Lab.; 2 Q.H.
Development of skills and teaching techniques in basketball, both men's and women's. Techniques of teaching volleyball and badminton. Survey of recreational swimming skills including participation. Techniques of leadership in aquatic games, competitive swimming and synchronized swimming. Miss Glancy
Fall and Winter Qtrs.
- 63.134 Recreation Skills V** 2 Lab.; 2 Q.H.
Techniques of teaching tennis and gymnastics. Red Cross Standard and Advanced First Aid.
To be Announced Spring Qtr.
- 63.135 Social Recreation** 2 Cl.; 2 Q.H.
Techniques of leadership, participation, planning for recreation in social settings for all ages — parties, programs and special events. Repertoire — mixers, dances, games, songs and skits. Creativity stressed. For non-recreation majors.
Miss Glancy Spring Qtr.
- 63.143 Winter Sports** 1 Q.H.
Five-day resident session at North Conway, New Hampshire. Participation according to ability in classes of Hannes Schneider Ski School. Evening seminars in skiing theory and teaching methods.
Miss Glancy Winter Qtr.
- 63.150 Human Anatomy I — Functional** 3 Cl.; 3 Q.H.
Gross anatomy of the bones, joints and muscles of the human body; emphasis on practical application in relation to students work in physical recreation.
Prof. Larson Fall Qtr.
- 63.151 Human Anatomy II — Functional** 3 Cl.; 3 Q.H.
Gross anatomy of the human body exclusive of the bone, joint and muscle systems; emphasis on practical application in relation to student's work in
Prof. Larson Winter Qtr.
- 63.160 Development and Utilization of Recreation Education Resources** 3 Cl.; 3 Q.H.
Survey of field and audio-visual education and resources; instruction and practice in use of equipment and materials; collection and processing of Recreation Development Center Resources.
Prof. Robinson and Staff Fall Qtr.
- 63.210 Philosophy of Recreation and Leisure** (Prereq. 63.120) 3 Cl.; 3 Q.H.
Goals for American Recreation studied in modern context; implications for the profession; historical background, concepts of work, leisure, recreation; trends, issues and future directions.
Prof. McCay Winter Qtr.

- 63.215 Trends and Issues in Recreation** 3 Cl.; 3 Q.H.
For non-majors in Recreation. National and international issues and trends in the professional field; trends in participation with professional implications; emerging programs; legislation; the leader and the future.
Prof. McCay Spring Qtr.
- 63.220 Methods and Materials in Recreation** 3 Cl.; 3 Q.H.
Philosophy, program planning, motivational techniques, methods of teaching and organizing materials and groups, utilization of equipment.
Prof. Robinson Winter Qtr.
- 63.240 Dance and the Cultures** 2 Cl.; 3 Lab.; 3 Q.H.
Folk dance and the related arts; emphasis on cultural understanding and appreciation through dance, music, arts, crafts, customs, foods, dress, history and traditions.
Miss Glancy and Staff Winter Qtr.
- 63.250 Group Dynamics** 3 Cl.; 3 Q.H.
The group process; how groups arrive at group identity; factors influencing size, purpose, behavior patterns, selection of individual members; training and experience in leadership techniques.
Miss Casavant Winter Qtr.
- 63.255 Adapted Recreation for Special Groups** 3 Cl.; 3 Q.H.
Concentrated study and individual projects in area of special interest; mentally retarded, handicapped, aging, culturally deprived, socially atypical, others.
To be Announced Winter Qtr.
- 63.260 Organization and Administration of Recreation and Parks** 3 Cl.; 3 Q.H.
Financial support and management; promotion; budgeting; personnel policies; arrangement and facilities; underlying principles and contemporary patterns.
Prof. Robinson Spring Qtr.
- 63.265 Techniques of Supervision and Evaluation**
(Prereq. Basic Progr. Math. and 63.250) 3 Cl.; 3 Q.H.
Current methods and materials; observation of recreation programs, supervision and evaluation; in service education; appraisal, measurement, evaluation.
Prof. Robinson Spring Qtr.
- 63.270 Arts and Crafts** 1 Cl.; 6 Lab.; 3 Q.H.
Opportunities to learn and to teach in various media — clay, paper, crayon, paint, print, leather, wood, metal, yarn, natural and scrap materials; emphasis on creativity, skill and enjoyment for all ages.
Miss Queiros Spring Qtr.
- 63.280 Supervised Field Experience and Teaching** 12 Q.H.
Equivalent to student teaching in education, professional assignment in recreation setting; i.e. industry, center, school, hospital, agency, organization, housing, settlement, park, playground, camp. Supervision and conferences. Seminar.
Prof. McCay and Staff Fall Qtr.

- 63.285 Research and Readings in Recreation** 4 Cl.; 4 Q.H.
 Survey of research; elementary techniques of research; review of current literature in the field.
 To be Announced Spring Qtr.
- 63.290 Senior Seminar and Projects** 4 Cl.; 4 Q.H.
 Independent study; development of individual projects, scheduled seminars; selected guests.
 To be Announced Winter Qtr.

Physical Therapy

- 64.111 Introduction to Physical Therapy** ½ Cl.; 1½ Lab.; 1 Q.H.
 A general orientation to the field of physical therapy, its role in the health professions, basic nursing procedures, and the variety of professional opportunities offered.
 Prof. Carlisle Winter Qtr.
- 64.112 Introduction to Physical Therapy**
 (Prereq. 64.111) ½ Cl.; 1½ Lab.; 1 Q.H.
 Theory and practice in body mechanics, postural examinations, and patient management.
 Miss Cerasoli Spring Qtr.
- 64.121 Gross Anatomy** (Prereq. 18.129) 3 Cl.; 6 Lab.; 5 Q.H.
 The structure and functions of the human body with particular emphasis on the skeletal, muscular and nervous systems. Lecture and laboratory with dissection.
 To be Announced Fall Qtr.
- 64.131 Applied Anatomy** (Prereq. 64.121, 11.137) 3 Cl.; 3 Lab.; 4 Q.H.
 A further study of neuromuscular function with emphasis on the mechanical and physiological factors involved; application to normal and pathological movement.
 Prof. Shaffer Winter Qtr.
- 64.143 Physical Therapy I** (Prereq. 64.121) 2 Cl.; 6 Lab.; 5 Q.H.
 Theory, demonstration and practice in massage, manual muscle testing and muscle re-education.
 Prof. Van Slyck Winter Qtr.
- 64.154 Physical Therapy II** (Prereq. 64.131, 64.143) 1 Cl.; 4 Lab.; 3 Q.H.
 Theory, demonstration and practice in basic therapeutic exercise, functional activities and goniometry.
 Prof. Van Slyck and Miss Cerasoli Spring Qtr.
- 64.155 Physical Therapy III** (Prereq. 64.131, 64.143) 2 Cl.; 2 Lab.; 3 Q.H.
 Theory and demonstration of prosthetic devices; Theory, demonstration and practice in heat, light and hydrotherapy.
 Prof. Van Slyck and Miss Cerasoli Spring Qtr.

- 64.164 Physical Therapy IV** (Prereq. 64.154, 64.155) 1 Cl.; 6 Lab.; 4 Q.H.
Theory, demonstration and practice in advanced therapeutic exercise.
Prof. Van Slyck Fall Qtr.
- 64.165 Professional Literature and Rehabilitation** (Prereq. 64.154, 64.155) 2 Cl.; 2 Q.H.
Professional literature through Journal Club; the total field of rehabilitation emphasizing knowledge of community resources for the disabled.
To be Announced Fall Qtr.
- 64.171 Physical Therapy V** (Prereq. 64.154, 64.155) 1 Cl.; 2 Lab.; 2 Q.H.
Theory, demonstration and practice in the physical therapy management of medical and surgical chest disorders.
Miss Cerasoli Fall Qtr.
- 64.172 Physical Therapy VI** (Prereq. 64.154, 64.155) 2 Cl.; 2 Lab.; 3 Q.H.
Theory, demonstration and practice in electrical muscle stimulation and testing procedures.
Prof. Shaffer Winter Qtr.
- 64.175 Ethics and Administration** (Prereq. 64.164) 2 Cl.; 2 Q.H.
History of the profession; principles and methods of administration of a physical therapy department; emphasis on development of desirable personal and professional attitudes and relationships.
Prof. Carlisle Winter Qtr.
- 64.185 Supervised Clinical Practice I** (Prereq. 64.154, 64.155) 17½ Lab.; 4 Q.H.
Supervised clinical experience in various physical therapy departments in the Boston area.
Prof. Shaffer and Clinical Faculty Fall and Winter Qtrs.
- 64.190 Clinical Seminar** (Prereq. concurrent with 64.185) 1 Cl.; 1 Q.H.
Selected topics related to clinical practice and presentation of case reports.
Prof. Shaffer Fall and Winter Qtrs.
- 64.195 Supervised Clinical Practice II** (Prereq. 64.185) 40 Lab.; 8 Q.H.
Advanced supervised clinical experience on a full-time basis; assignments in Massachusetts and other states.
Prof. Shaffer and Clinical Faculty Spring Qtr.
- 64.210 Pathology** (Prereq. 64.121) 3 Cl.; 3 Q.H.
Lectures and demonstrations of pathological gross specimens; inflammation; repair; infection; immunity and hypersensitivity; degenerative processes; disturbances of metabolism and circulation; disorders of growth, including tumors.
Cherardo J. Gherardi, M.D. Winter Qtr.
- 64.220 Clinical Medicine I** (Prereq. 64.121) 3 Cl.; 3 Q.H.
Lectures covering the various areas of medicine and surgery related to conditions commonly encountered in patients treated by the physical therapist; pediatrics, general medicine, general surgery.
Sidney Koretsky, M.D. Fall Qtr.

- 64.221 Clinical Medicine II** (Prereq. 64.200) 2 Cl.; 2 Q.H.
A continuation of Clinical Medicine 64.220. Orthopedic conditions; thoracic surgery; Role of the Laboratory.
Arthur A. Thibodeau, M.D. Spring Qtr.
- 64.222 Clinical Medicine III** (Prereq. 64.220, 64.221) 3 Cl.; 3 Q.H.
A continuation of Clinical Medicine 64.220. Clinical Neurology and Neurosurgery; plastic surgery; burns; dermatology; gynecology; urology.
John F. Sullivan, M.D. and Associates Winter Qtr.
- 64.235 Psychiatry** (Prereq. 19.102; 50.121) 3 Cl.; 3 Q.H.
Modern psychiatric methods of diagnosis and treatment with special emphasis on these conditions with which the physical therapist is concerned.
Arthur W. McMahon, Jr., M.D. Spring Qtr.
- 64.245 Applied Physiology** (Prereq. Phys. 1 and 2, 64.164) 2 Cl.; 3 Lab.; 3 Q.H.
Effects on the physiological processes of the body produced by basic treatment and testing procedures of physical therapy; modifications due to pathological changes.
Harold M. Sterling, M.D. and Associates Winter Qtr.
- 64.250 Neuroanatomy** (Prereq. 64.131) 3 Cl.; 3 Q.H.
Morphological and functional management of the nervous system; derangement of normal structure and function of the nervous system in various diseases.
Joseph Segarra, M.D. Fall Qtr.

Health Education

- 65.129 Health Education** 3 Cl.; 3 Q.H.
Principles of personal health; emphasis upon information pertinent to mental and physical well-being, current social behavior, and effective approaches to college living.
Prof. Morton Fall and Spring Qtr.
- 65.210 Personal Health** 3 Cl.; 3 Q.H.
Principles of healthful living; their application to interpersonal relations and physical education.
Prof. Kassabian Fall Qtr.
- 65.215 School and Community Health** (Prereq. 65.129) 3 Cl.; 3 Q.H.
Focus on the teacher's important role in developing and relating the principles, patterns and programs of school and community health education.
Prof. Kassabian Spring Qtr.
- 65.216 Methods and Materials in Health Education** (Prereq. 65.215) 4 Cl.; 4 Q.H.
Materials appropriate to the teaching of health and safety in the elementary and secondary school; emphasis on direct unit instruction.
Prof. Rowlands Winter Qtr.

65.218 Public Health

3 Cl.; 3 Q.H.

Principles of public health with particular emphasis on the emerging patterns of community organizations and activities in the public health field.
Prof. Morton

Winter and Spring Qtrs.

Pharmacy and Pharmacy Administration

71.201 Pharmacy Orientation

1 Cl.

The curriculum, the organizations in pharmacy and their objectives, the ethical standards of the profession, the opportunities in its various branches, and the responsibilities of the pharmacist as a member of the health team.

Prof. Brillhart

Fall Qtr.

71.202 Pharmacy Orientation

(Prereq. 71.201) 1 Cl.

Continuation of 71.021.

Prof. Brillhart

Winter Qtr.

71.211 Pharmaceutical Methodology

(Prereq. 12.142) 3 Cl.; 3 Lab.; 4 Q.H.

Application of fundamental principles and methods involved in the formulation of pharmaceuticals, including official preparations; pharmaceutical calculations.

Prof. Schermerhorn

Fall Qtr.

71.212 Pharmaceutical Preparations

(Prereq. 71.211) 3 Cl.; 3 Lab.; 4 Q.H.

Classes of official preparations and individual dosage forms, based on physical-chemical principles on an introductory level; pharmaceutical calculations.

Prof. Smith

Spring Qtr.

71.221 Physical Pharmacy

(Prereq. 71.212) 3 Cl.; 3 Lab.; 4 Q.H.

Application of physical-chemical principles and laws to pharmaceutical systems; solution kinetics and stability, colloidal dispersions, buffer systems, colligative properties, aerosols, compression characteristics of solid dosage forms.

Prof. Pruyn

Fall Qtr.

71.222 Pharmaceutical Technology

(Prereq. 71.221) 3 Cl.; 3 Lab.; 4 Q.H.

Application of all principles studied in previous courses in pharmacy to selected preparations; compound dosage forms, sustained action preparations, tablet coating, parenterals, coloring and flavoring agents.

Prof. Pruyn

Spring Qtr.

71.223 Business Law

4 Cl.; 4 Q.H.

A comprehensive study of the legal aspects relative to the operation of retail pharmacies; the problems of contracts, agency, negotiable instruments, business organizations and leases.

Prof. Goldstein

Fall Qtr.

- 71.232 Prescription Pharmacy** (Prereq. 71.222) 4 Cl.; 3 Lab.; 5 Q.H.
 A correlation and integration of the previous instruction in the development of the pharmacist as a professional person. The compounding and dispensing of solid and semi-solid dosage forms of medication; the objectives of the course are to develop in the student: the ability to understand and interpret prescriptions, skill in compounding prescriptions, ability to evaluate and correct prescriptions from a pharmaceutical point of view, appreciation of the legal aspects of prescription practice, and an increased understanding of the use of drugs. Prescription clinic.
 Prof. Schermerhorn Winter Qtr.
- 71.234 Pharmaceutical Jurisprudence** 3 Cl.; 3 Q.H.
 Federal and state laws that regulate the practice of pharmacy; emphasis on the Food and Drug Act; narcotic laws; the rules and regulations of the Board of Pharmacy.
 Prof. Goldstein Fall Qtr.
- 71.237 Drug Marketing** (Prereq. 71.234) 4 Cl.; 4 Q.H.
 An analysis and study of the basic marketing concepts and their application to the promotion and distribution of goods as they relate to pharmacy. Emphasis is placed on packaging, advertising, channels of commerce, and the laws affecting distribution. Case studies and seminars supplement the lecture series.
 Prof. Goldstein Winter Qtr.
- 71.238 Retail Pharmacy Management**
 (Prereq. 41.208, 71.223, 71.237) 4 Cl.; 4 Q.H.
 A comprehensive study of the operation of a retail pharmacy. Topics covered will include the planning, organizing, financing, control, personnel, and policy determination of a modern pharmacy. Due emphasis is placed on buying, merchandising, and the promotion of goods. The lectures will be supplemented with case studies and practice in our Professional (Gillette) Pharmacy.
 Prof. Goldstein Spring Qtr.
- 71.239 Parapharmaceuticals** 2 Cl.; 2 Q.H.
 A lecture-demonstration course designed to provide the student with a practical knowledge of the nature and applications of the various surgical devices, appliances, bandages, and hospital and sickroom supplies used in modern patient care.
 Prof. Schermerhorn Spring Qtr.
- 71.240 Introduction to Institutional Pharmacy** 2 Cl.; 2 Q.H.
 A survey course designed to acquaint the student with the operation of the modern hospital and nursing home from the point-of-view of the hospital pharmacist. The position of pharmacy services in relationship to over-all operation of the hospital will be considered.
 Prof. Schermerhorn Spring Qtr.

71.241 Clinical Pharmacy

2 Cl.; 3 Lab.; 3 Q.H.

This course is designed to introduce the student to the patient-oriented aspects of the practice of pharmacy. The laboratory portion of the course will consist of weekly hospital rounds with the medical staff. The didactic portion will consist of a discussion of the cases observed and the medications prescribed. Limited enrollment.

Prof. Schermerhorn and Staff

Spring Qtr.

Medicinal Chemistry

72.221 Inorganic Medicinals

(Prereq. 12.126) 4 Cl.; 4 Q.H.

Source, methods of manufacture, properties, uses, and compounding of inorganic medicinals; relationship between electronic structure and physiological activity of ions; radioisotopes in pharmacy; the role of inorganic ions in preservation and stabilization of pharmaceuticals.

Prof. Brent

Spring Qtr.

72.222 Drug Analysis

(Prereq. 12.174) 4 Cl.; 4 Lab.; 5 Q.H.

Principles of quantitative analysis applied to natural or synthetic chemicals and drugs used in pharmacy and medicine; emphasis on the instrumental and chromatographic methods used in the official compendia.

Prof. Clemson

Fall Qtr.

72.231 Organic Medicinals

(Prereq. 12.143) 4 Cl.; 4 Q.H.

Modern synthetic drugs and natural products of medicinal importance; uses, syntheses, incompatibilities, correlation of physical properties, structures and biological activity.

Prof. Brent

Fall Qtr.

72.232 Organic Medicinals

(Prereq. 72.231) 3 Cl.; 3 Q.H.

Continuation of 72.231.

Prof. Brent

Winter Qtr.

72.233 Organic Medicinals

(Prereq. 72.232) 3 Cl.; 3 Q.H.

Continuation of 72.232.

Prof. Brent

Spring Qtr.

Pharmacology and Pharmacognosy

73.221 Pharmacognosy

(Prereq. 18.113, 12.143) 4 Cl.; 3 Lab.; 4 Q.H.

Introduction to the natural products of biological origin which are of pharmaceutical and medicinal significance; their gross characteristics and active constituents; macroscopic and microscopic identification including selected physical and chemical methods; a biochemical approach based upon the general chemical groups of the major constituents.

Prof. Brillhart

Fall Qtr.

73.231 Pharmacology

(Prereq. 18.159, 73.221) 3 Cl.; 3 Lab.; 4 Q.H.

Fundamental relationships and principles associated with the pharmacological characteristics of drugs; basic toxicology and essential emergency procedures; agents used topically or affecting the skin or the mucous membranes; gastro-intestinal, nutritional and dietary agents.

Prof. Inashima

Fall Qtr.

- 73.232 Pharmacology** (Prereq. 73.231) 3 Cl.; 3 Lab.; 4 Q.H.
 Basis of chemotherapy and systemic anti-infective agents; drugs affecting the central nervous system; diagnostics.
 Prof. Inashima Winter Qtr.
- 73.233 Pharmacology** (Prereq. 73.232) 3 Cl.; 3 Lab.; 4 Q.H.
 Agents acting on the peripheral nervous system; cardiovascular, renal and hematopoietic system drugs; agents affecting the endocrine and reproductive functions.
 Prof. Inashima Spring Qtr.
- 73.237 Pharmacognosy** (Prereq. 73.221, 18.120) 3 Cl.; 3 Q.H.
 A continuation of 73.221 with special emphasis upon products obtained from animals and microorganisms to be used for immunological and anti-biotic purposes. A discussion of allergenic plants and substances along with the different types of pesticides.
 Prof. Brillhart Fall Qtr.
- 73.238 Public Health** (Prereq. 18.120, 73.237) 3 Cl.; 3 Q.H.
 Emphasis is placed upon the Pharmacist's responsibility as to knowledge and dissemination of correct information concerning health and disease. Included for consideration are the following: Voluntary and official health agencies, potable and polluted waters, waste disposal, food control and poisoning, air pollution and radiation, control of disease, housing, nutrition, mental health, accidents and poisoning, socio-economic health related problems of national and world wide interest.
 Prof. Brillhart Winter Qtr.
- 73.239 Public Health** (Prereq. 73.238) 3 Cl.; 3 Q.H.
 A continuation of 73.238.
 Prof. Brillhart Spring Qtr.
- 73.241 Biochemistry** (Prereq. 12.143) 4 Cl.; 4 Lab.; 5 Q.H.
 A study of the composition of living matter and the physio-chemical changes that occur in normal physiological as well as in altered conditions. The chemistry of the basic substances of the protoplasm along with the influence of food factors, hormones, and other substances regulating body processes are discussed in relation to the metabolic pathways of biochemical agents. Laboratory experiments are designed for both qualitative and quantitative study of the chemistry of cellular components.
 Prof. Inashima Spring Qtr.

Nursing

- 80.100 Introduction to Nursing** 1 Cl.; 1 Q.H.
 Acquaints the student with the evolvement of nursing and its role in society today. Emphasis is placed on the latter in discussions of preparation for nursing responsibilities inherent in the nursing role, and events that are influencing nursing practice as it is today and projected for the future.
 Prof. Middleton Fall Qtr.

80.101 Fundamentals of Nursing

4 Cl.; 4 Lab.; 5 Q.H.

Basic to all other courses in nursing. Focus is on the patient as an individual. Underlying this is the concept of homeostasis and the role of the nurse in meeting human needs. Nursing action is based upon principles drawn from the behavioral, social and biological sciences. Assignments in patient care are designed to provide the student with opportunities to interpret these principles in the promotion of health and prevention of illness.

Prof. Long

Fall Qtr.

80.102 Fundamentals of Nursing (Prereq. 80.100, 80.101) 4 Cl.; 4 Lab.; 5 Q.H.
 Continuation of 80.101.

Prof. Long

Winter Qtr.

80.103 Fundamentals of Nursing

(Prereq. 80.102) 4 Cl.; 4 Lab.; 5 Q.H.

Continuation of 80.102.

Prof. Long

Spring Qtr.

80.201 Nursing

2 Cl.; 3 Lab.; 3 Q.H.

Introduction to the sociological perspective that is continued throughout the curriculum. Student also begins to look at the historical development of nursing and to develop her own concept of nursing. Orientation to social systems and their influence on the student and the individuals for whom she will care in her role as a nurse. Laboratory experiences include group discussions and field trips.

Prof. Dorie

Fall Qtr.

80.202 Nursing

(Prereq. 80.201) 2 Cl.; 3 Lab.; 3 Q.H.

Major emphasis is placed on services which are concerned with health. Field trips to selected agencies and group assignments investigating particular health problems provide opportunities for students to develop awareness of health problems affecting groups.

Prof. Dorie

Winter Qtr.

80.203 Nursing

(Prereq. 80.201, 80.202) 2 Cl.; 3 Lab.; 3 Q.H.

Particular attention is focused on the individual, his life cycle, and his basic needs. Consideration is given to the nurse as a team member and as an individual affected by and implementing change. Laboratory experiences include group discussions and field trips.

Prof. Dorie

Spring Qtr.

80.204 Nursing

(Prereq. 80.203) 4 Cl.; 3 Lab.; 5 Q.H.

Introduces principles and basic skills of nursing and their application in a variety of clinical settings. Emphasis is placed on the assessment of the patient in relation to universal needs and the understanding of him as an individual, a member of the family, and the community, as these contribute to the attainment of his health and life goals.

Prof. Messler

Fall and Winter Qtrs.

80.205 Nursing

(Prereq. 80.204) 4 Cl.; 3 Lab.; 5 Q.H.

Focuses on exploring problems common to all individuals as they lose ability to meet their own health needs. Clinical practice will continue to introduce skills and activities to meet the needs of patients, particularly in the general hospital settings.

Prof. Messler

Spring and Summer Qtrs.

- 80.206 Nursing** (Prereq. 80.205) 4 Cl.; 6 Lab.; 6 Q.H.
 A continuation of 80.205.
 To be announced Fall and Winter Qtrs.
- 80.210 Seminar** (to be arranged) 9 Q.H.
 An independent research project in an area of health care. The study will be related to a selected clinical experience under faculty guidance.
 To be announced 1970-71
- 81.101 Medical-Surgical Nursing** (Prereq. 80.103) 6 Cl.; 15 Lab.; 11 Q.H.
 Utilizing the concept that all illnesses produce alterations in body function, the student is introduced to selected conditions requiring medical and/or surgical intervention. Major emphasis in classroom and clinical instruction is upon the nurse's role in meeting patients' physical and psychosocial needs, further developing nursing techniques, and learning specific skills needed to care for assigned patients.
 Prof. Bosanko All Qtrs.
- 81.102 Medical-Surgical Nursing** (Prereq. 81.101) 3 Cl.; 9 Lab.; 6 Q.H.
 This course is sequential to 81.101. It is designed to broaden the student's understanding of adults with more serious forms of physical illness. The content has been developed to present the nurse's responsibilities in caring for patients with illnesses that may result in major loss of body function or in death itself. Classroom and clinical experiences focus on the understandings and skills involved in providing complex nursing care for selected patients.
 Prof. Bosanko Fall, Winter and Spring Qtrs.
- 81.201 Medical-Surgical Nursing** (Prereq. 80.206) 4 Cl.; 5 Lab.; 9 Q.H.
 Study of the physiologic changes that underlie medical-surgical health problems. Guided clinical experiences are planned with special emphasis on health teaching, planning continuity of care and the effects of illness on an individual's pattern of living.
 To be announced All Qtrs.
- 82.101 Maternal and Child Health** (Prereq. 80.103) 6 Cl.; 18 Lab.; 12 Q.H.
 Focuses on the family and the individual and their developmental task with emphasis on positive health practices within the family unit. The nursing approach centers upon the health needs of mothers and children of all ages. The needs of the hospitalized child are identified by studying the effect of illness upon his normal growth and development. The common illnesses of childhood are discussed.
 Prof. Space All Qtrs.
- 82.201 Maternal and Child Health** (Prereq. 80.206) 4 Cl.; 15 Lab.; 9 Q.H.
 Involves various aspects and stresses within the family structure, particularly as they relate to family health and illness. Included will be preparation for marriage, beginnings of a family, parent-child relationships, childhood illnesses and diseases. The family will be considered as a part of the community and the effects of one on the other as they relate particularly to maternal and child health.
 To be announced All Qtrs.

83.101 Psychiatric Nursing (Prereq. 81.101, 82.101) 3 Cl.; 9 Lab.; 6 Q.H.
 Assists the student to acquire additional knowledge of human behavior; to provide the opportunity to achieve understanding of selected human motivations and defenses and to learn additional interpersonal skills which may be used in the nursing care of patients. The opportunity to apply this knowledge; to observe and analyze behavior and to practice the skills is offered in supervised laboratory sessions.
 Prof. Gonyow Fall, Winter and Spring Qtrs.

83.201 Psychiatric Nursing (Prereq. 80.206) 5 Cl.; 4 Lab.; 9 Q.H.
 Designed to increase and develop knowledge of mental illness, understanding of the dynamics of human behavior, and the interrelationship of theory and practice as it applies to clinical and community aspects of psychiatry and psychiatric nursing.
 To be announced All Qtrs.

84.201 Public Health Nursing 6 Cl.; 9 Lab.; 9 Q.H.
 Increases understanding of the variety of ways communities organize to meet the health and welfare needs of their members. Principles of public health and public health nursing are examined in depth. Attention is given to current health and welfare legislation, environmental factors affecting health, and the role of the nurse in prevention of disease and maintenance of health. Laboratory experiences will provide opportunities to work with individuals, families and community agencies.
 To be announced 1970-71

Cooperative and Interdisciplinary Courses

90.100 Introduction to Engineering (Freshman Orientation) 1 Cl.
 Instructs the student in the traditions, activities and procedures at the University; proper methods of study; attitudes needed for success; techniques and procedures of work under the Cooperative Plan.

90.101 Introduction to Engineering (Freshman Orientation) 1 Cl.; 1 Q.H.
 A history of engineering, to provide a better understanding of the various fields of engineering; to add perspective and motivation toward engineering careers, and to assist the students in selecting a particular branch of engineering.

90.201 Great Issues in Social Science 3 Cl.; 3 Q.H.
 An interdisciplinary course in which the data and methods of the social sciences will be employed in the analysis of specific issues. Specialists from the Departments of Economics, History, Political Science, Psychology, and Sociology and Anthropology will participate.

90.251 Placement Techniques 1 Cl.; 1 Q.H.
 Career selection and development are discussed concurrently with methods of achieving career goals. Techniques of resumé preparation, personal presentation, and effective written communication are treated to facilitate the planning and implementation of a professional career program.

90.252 Professional Development

2 Cl.; 1 Q.H.

Career selection and development are discussed concurrently with methods of achieving career goals. Techniques of resumé preparation, personal presentation and effective written communication are treated to facilitate the Professional engineers and the appropriate department chairmen discuss the professional and ethical aspects of engineering, including: Engineering, Licensure, U.S. Patent System, Ethics in Engineering Practice, and the activities of ECPD and EJC.

90.253 Professional Development for Teachers

1 Cl.; 1 Q.H.

Teaching as a profession is discussed concurrently with methods of achieving career goals by developing the techniques of resumé preparation, effective oral and written communication, and the interviewing process. Topics affecting professional growth, such as teacher certification, professional ethics and professional development, will be examined. College of Education faculty will discuss the various aspects of professionalism.

90.254 Professional Development for Nurses

1 Cl.; 1 Q.H.

Nursing as a profession is discussed concurrently with methods of assisting the senior to assume her role as a graduate nurse. Topics relative to personal, legal, and professional responsibilities are examined as well as techniques of resumé preparation, effective oral and written communication and personal presentation.

Military Science

91.101 Military Science I

3 Cl.; 1 Q.H.

Organization of the Army and ROTC; care of the uniform and rifle, military courtesy, discipline and drill; relationships of U.S. Army and national security.

Fall Qtr.

91.102 Military Science I

(Prereq. 91.101) 3 Cl.; 1 Q.H.

American Military History and leadership laboratory.

Winter Qtr.

91.103 Military Science I

(Prereq 91.102) 1 Cl.; 2 Lab.; 1 Q.H.

American Military History and leadership laboratory.

Spring Qtr.

91.104 Military Science II

(Prereq. 91.103) 3 Cl.; 1 Q.H.

Map and aerial photograph reading; introduction to basic tactics.

Fall and Winter Qtrs.

91.105 Military Science II

(Prereq. 81.104) 1 Cl.; 2 Lab.; 1 Q.H.

Small unit tactics and techniques; and leadership laboratory.

Spring and Summer Qtrs.

91.106 Military Science III

(Prereq. 91.105) 3 Cl.; 2.5 Q.H.

Leadership techniques; small unit operations and tactics.

Fall and Winter Qtrs.

- 91.107 Military Science III** (Prereq. 91.106) 1 Cl.; 2 Lab; 2.5 Q.H.
Orientation in branches of Army; and leadership laboratory.
Spring and Summer Qtrs.
- 91.108 Military Science III** (Prereq. 91.107) 3 Cl.; 2.5 Q.H.
Military teaching principles; unit operations; Army Staff relationships.
Fall and Winter Qtrs.
- 91.109 Military Science V** (Prereq. 91.108) 1 Cl.; 2 Lab.; 2.5 Q.H.
Principles of operations; counterinsurgency operations; and leadership laboratory.
Spring and Summer Qtrs.
- 91.110 Military Science IV** (Prereq. 91.109) 3 Cl.; 2.5 Q.H.
Military logistics; Army administration techniques; role of U.S. in world affairs.
Fall and Winter Qtrs.
- 91.111 Military Science IV** (Prereq. 91.110) 2 Cl.; 1 Lab.; 2.5 Q.H.
Principles of military law; review of map reading; service orientation; leadership techniques.
Spring Qtr.

Criminal Justice

- 92.101, Introduction to Criminal Justice** 4 Cl.; 4 Q.H.
A survey of the evolution of justice from earliest times, developed historically, with particular emphasis on Western justice and American justice, including the roles played by the judiciary; state police and state investigative organizations; and county and municipal police departments.
Professor Cunliffe Fall Qtr.
- 92.102 Introduction to Criminal Justice** 4 Cl.; 4 Q.H.
Continuation of 92.101.
Prof. Cunliffe Winter Qtr.
- 92.103 Introduction to Criminal Justice** 4 Cl.; 4 Q.H.
Continuation of 92.102.
Prof. Cunliffe Spring Qtr.
- 92.110 Police-Community Relations** 4 Cl.; 4 Q.H.
Police-public contact; uses of the communications media in projecting the police image; responsibilities of police in dealing effectively with minority groups, civil rights, civil disorder, and public protection. An exploration of the role and function of the police in intergroup relations.
Prof. Sheehan Fall and Winter Qtrs.
- 92.111 Police Patrol** 4 Cl.; 4 Q.H.
The fundamentals of foot, vehicular, water, and air patrol by uniformed police; deployment of personnel; beat layouts; mechanics of arrest; riot control; raids; stopping methods; and the transportation of prisoners.
Prof. Cunliffe Fall and Winter Qtrs.

- 92.121 Investigative Report Writing** 4 Cl.; 4 Q.H.
 Determining report content through interpretation and evaluation of information. Emphasis is placed on collection of information, accurate description, analysis of information, and concise writing. The student is required to participate in numerous report-writing projects.
 Professor Cunliffe Spring and Summer Qtrs.
- 92.122 Interviews and Interrogation** 4 Cl.; 4 Q.H.
 The questioning of suspects, witnesses, victims, informants, and complainants; laws governing interrogation practices; techniques for legally and morally acceptable interrogation procedures. Mock cases are used so that all class members have an opportunity to interrogate or interview under simulated conditions.
 Prof. Sheehan Spring and Summer Qtrs.
- 92.131 Law Enforcement Administration and Management** 4 Cl.; 4 Q.H.
 The principles of police organization, administration and management, including staff and line functions, chain of command, span of control, selection of personnel and promotional systems. Consideration is also given to special problems such as strikes, natural and atomic disasters, narcotic traffic and vice control.
 Fall and Winter 1969-1970
- 92.132 Police Supervision** 4 Cl.; 4 Q.H.
 The police supervisor's role in discipline; intradepartmental relations, problem-handling and personnel policies. Problems relating to supervisory relationships, wages, grievances, morale, and safety.
 Spring and Summer 1969-1970
- 92.133 Criminal Investigation and Case Preparation** 4 Cl.; 4 Q.H.
 Crime scene procedure; collection and preservation of evidence; recording the crime scene; surveillance; identification; investigative techniques; and methods of preparing a case for court.
 Fall and Winter 1969-1970
- 92.134 Civil Liberties: Substantive Rights** 4 Cl.; 4 Q.H.
 Utilizing Supreme Court decisions and other sources, this course will encompass a study of the constitutional rights of speech, press, religion, association, equal protection of the laws, and their relevance to a democratic society.
 Spring and Summer 1969-1970
- 92.141 Criminal Law: Procedural Due Process** 3 Cl.; 3 Q.H.
 Utilizing current Supreme Court decisions and other sources, this course will examine the relationship between the Bill of Rights and the States, with primary emphasis on the guarantees of fair trial, counsel, privacy, immunity from self-incrimination, and other constitutional safeguards in state and federal criminal proceedings.
 Fall and Winter 1970-1971
- 92.142 Evidence and Court Procedure** 4 Cl.; 4 Q.H.
 Rules of evidence; principles of exclusion; evaluation and examination of evidence and proof; competency; consideration of witnesses. Fundamentals of court room procedure; testifying in court; the principles of prosecuting

a case; the introduction of evidence. Role-playing is used as a learning device in mock trials. Class members are required to attend and report on criminal trials.
Spring and Summer 1970–1971

92.143 Introduction to Criminalistics 2 Cl.; 4 Lab.; 4 Q.H.

A survey of the elements of microscopy, spectroscopy, and basic chemistry as they apply to the study of firearms, hair, fibers, blood, paint, tools, glass, documents, laundry marks, poisons, and other materials which comprise physical evidence.
Fall and Winter 1970–1971

92.144 Police Juvenile Methods 4 Cl.; 4 Q.H.

The role of the police in crime prevention, with emphasis on theory, administration, control, treatment, confinement, community resources, relations with the public, and the juvenile court.

Spring and Summer 1970–1971

92.151 Traffic Law Enforcement 4 Cl.; 4 Q.H.

Accident prevention and investigation; traffic surveys; selective enforcement; traffic engineering; administration of traffic divisions; and traffic safety education.
Fall and Winter 1971–1972

92.152 Records and Computer Technology in Law Enforcement 4 Cl.; 4 Q.H.

Records systems and utilization; concentration on theoretical and practical applications; acquainting the future police executive with automatic electronic equipment and its potential applications, including a comprehensive overview of machine components, their characteristics and assembly; comparison of speed, capacity, flexibility, reliability, and cost; discussion of input and output devices, memory, arithmetic and control elements; elementary programming; and number systems.
Spring 1971–1972

92.153 Police Planning 3 Cl.; 3 Q.H.

The purpose, need, and scope of planning in the police operation; establishing and staffing a planning bureau; collection and evaluation of statistical data; and the use of data processing in planning procedures.

Fall and Winter 1971–1972

92.154 Research Methods in Law Enforcement 3 Cl.; 3 Q.H.

An opportunity for each student to conduct a research project with the supervision and guidance of his class instructor. The project must be specifically related to a police interest or operation. Various research methods are analyzed and discussed. Progress reports are due periodically, and a paper is required
Spring 1971–1972

92.155 Seminar in Law Enforcement 3 Cl.; 3 Q.H.

An opportunity for free discussion about the numerous problems facing the law enforcement officer. Periodic oral and written reports are required. Guest lecturers are invited to participate in and lead discussion sessions. An effort is made to have each student formulate his own philosophy of law enforcement immediately prior to his graduation.

Spring 1971–1972





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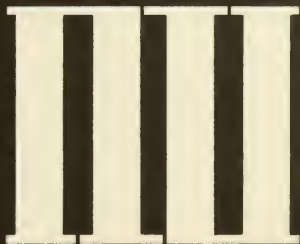
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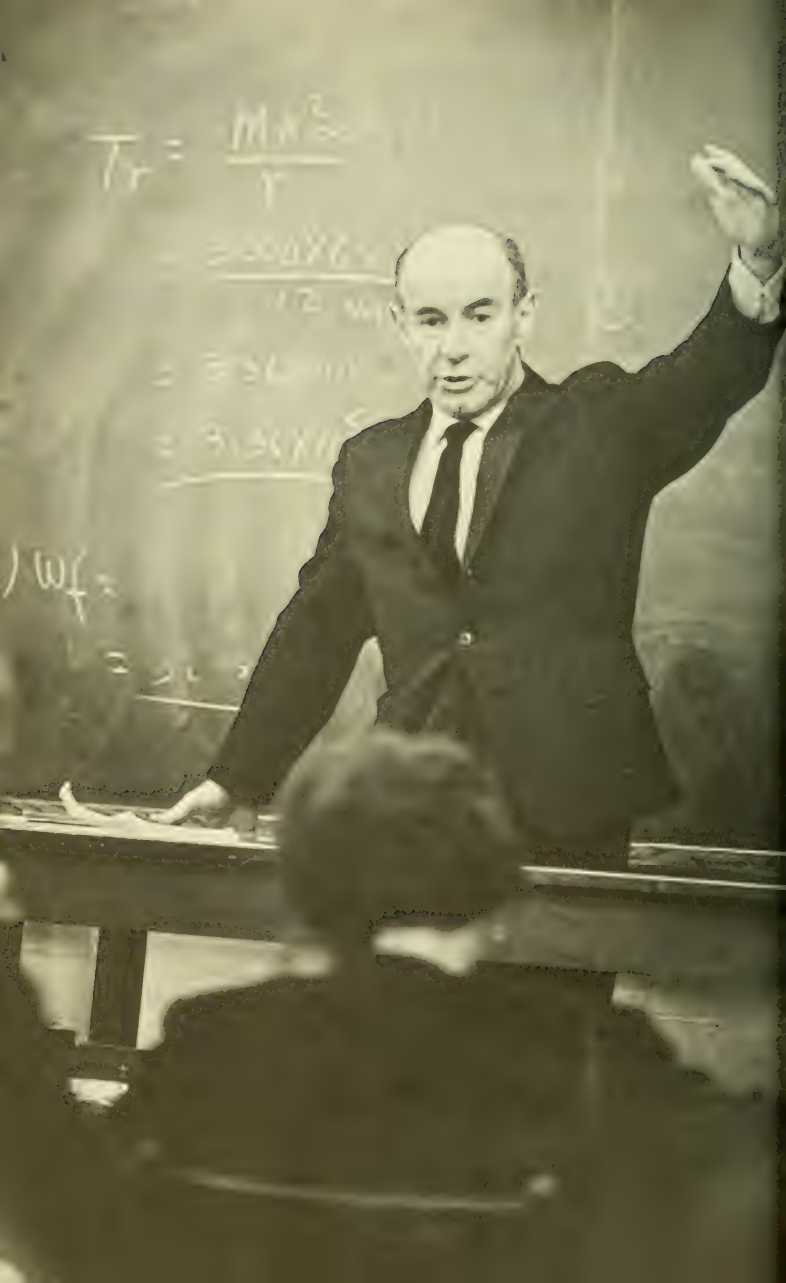


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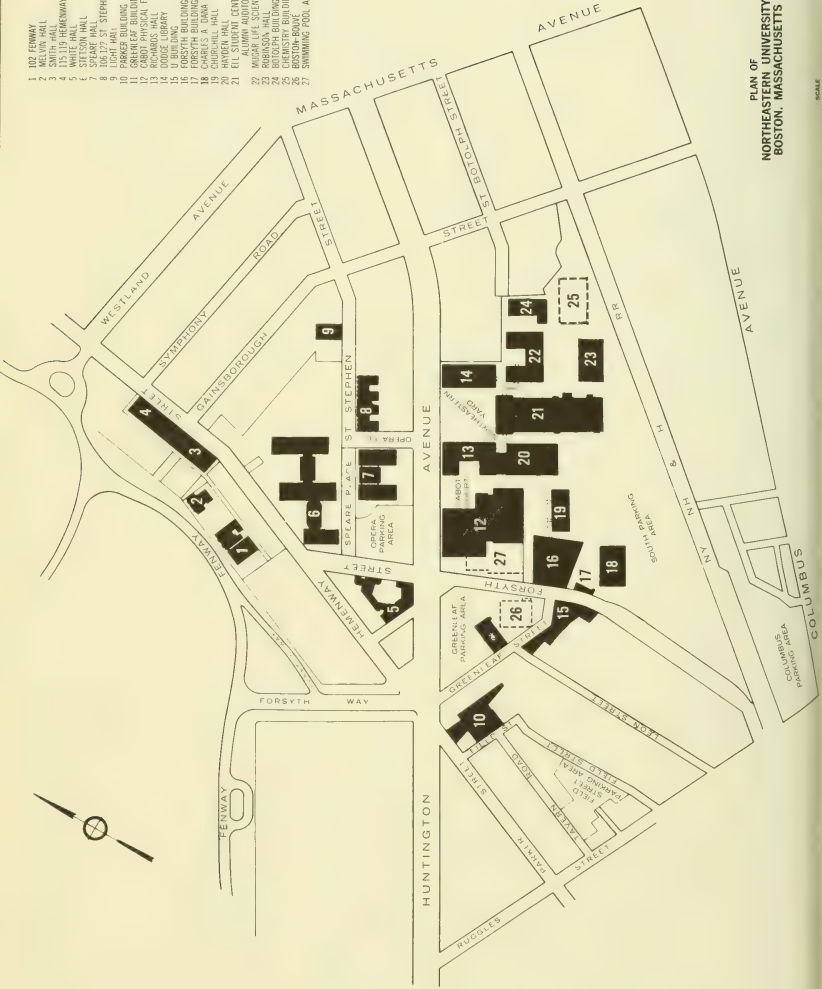
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PLAN OF
NORTHEASTERN UNIVERSITY
BOSTON, MASSACHUSETTS

SCALE
1" = 100'

university college offices

Office for General Information	219 Hayden Hall	437-2400
Office of the Registrar	120 Hayden Hall	437-2300

Regular Office Hours

Boston	Monday–Friday	8:30 a.m.–8:30 p.m.
	Saturday	8:30 a.m.–12 noon
Burlington	Monday–Friday	8:00 a.m.–10:00 p.m.
	Saturday	8:00 a.m.–1:00 p.m.
Framingham North High School	Monday–Thursday	5:30–10:00 p.m.
	Monday–Thursday	5:30–10:00 p.m.
Lynn English High School	Monday–Thursday	5:30–10:00 p.m.
Weymouth High Schools	Monday–Thursday	5:30–10:00 p.m.

Summer Office Hours

Boston 219 Hayden Hall	Monday–Thursday	8:30 a.m.–8:30 p.m.
	Friday	8:30 a.m.–4:30 p.m.
	Saturday	Closed
120 Hayden Hall	Monday–Friday	8:30 a.m.–8:30 p.m.
	Saturday	8:30 a.m.–12 noon
Burlington	Monday–Friday	8:00 a.m.–10:00 p.m.
	Saturday	8:00 a.m.–1:00 p.m.

Program Advisers

Program advisers are available each evening by appointment in the University College Office. These faculty members are competent to assist the student in planning a program suitable to his general educational and career objectives. They can also answer questions relating to degree requirements, course sequence, and proper scheduling of courses. Appointments may be arranged by calling the University College Office (437-2400) or by coming in person to 219 Hayden Hall. There is no charge for this service.

Program advisers are also available during registration at all registration sites. No appointment is necessary.

Counseling and Testing Center

Adult students attending Northeastern University may arrange appointments for counseling and testing services by telephoning 437-2142, or by going to the the Counseling and Testing Center, 302 Ell Student Center. Professional counselors are available certain evenings until 8:30.

1968-1969 academic calendar

Fall Quarter 1968

Classes begin September 16

FALL REGISTRATION

Boston—Former students	5:30–8:30 p.m.	September 3–6
	9:00 a.m.–12 noon	September 7
New students	5:30–8:30 p.m.	September 9–13
Burlington—All students	12 noon–8:30 p.m.	August 29
	5:30–8:30 p.m.	September 4 and 6
Lynn English		
High School—All students	5:30–8:30 p.m.	September 10 and 12
Weymouth—All students	5:30–8:30 p.m.	September 3 and 5
Framingham—All students	5:30–8:30 p.m.	September 9 and 11
Classes begin		September 16
Columbus Day	No classes	October 12
Veterans' Day	No classes	November 11
Thanksgiving Day	No classes	November 27–30
Final Examination period for Fall Quarter		December 2–7

Winter Quarter 1968–1969

Classes begin December 9, 1968

WINTER REGISTRATION

Boston—All students	5:30–8:30 p.m.	December 2–6
Burlington—All students	5:30–8:30 p.m.	December 3
Lynn English		
High School—All students	5:30–8:30 p.m.	December 6
Weymouth—All students	5:30–8:30 p.m.	December 5
Framingham—All students	5:30–8:30 p.m.	December 4
Classes begin		December 9
Christmas vacation		December 23–January 1
Washington's Birthday	No classes	February 22
Final Examination period for Winter Quarter		March 3–8

Spring Quarter 1969

Classes begin March 17

SPRING REGISTRATION

Boston—All students	5:30—8:30 p.m.	March 3—7
Burlington—All students	5:30—8:30 p.m.	March 4
Lynn English		
High School—All students	5:30—8:30 p.m.	March 7
Weymouth—All students	5:30—8:30 p.m.	March 6
Framingham—All students	5:30—8:30 p.m.	March 5
Spring recess		March 10—15
Spring Quarter begins		March 17
Patriots' Day	No classes	April 19
Memorial Day	No classes	May 30
Final Examination period for Spring Quarter		June 2—7
Commencement		June 15

Summer Quarter 1969

Segment 1	June 16—July 11
Segment 2	July 14—August 8
Segment 3	August 11—September 5

REGISTRATION FOR ENTIRE SUMMER TERM

Boston—All students	5:30—8:30 p.m.	June 9—13
Burlington—All students	12 noon—8:30 p.m.	June 10

REGISTRATION FOR SEGMENT 2

Boston—All students	5:30—8:30 p.m.	July 14 and 15
Burlington—All students	5:30—8:30 p.m.	July 14 and 15

REGISTRATION FOR SEGMENT 3

Boston—All students	5:30—8:30 p.m.	August 11 and 12
Burlington—All students	5:30—8:30 p.m.	August 11 and 12

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aims and scope of the university

Founded in 1898, Northeastern University is incorporated as a privately endowed nonsectarian institution of higher learning under the General Laws of Massachusetts. By special enactment, the State Legislature has given the University general degree-granting powers. The University is governed by a Board of Trustees elected by and from the Northeastern University Corporation, which comprises more than 150 distinguished business and professional men.

From its beginning Northeastern University's dominant purpose has been to identify community educational needs and to meet these in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has pioneered new areas of educational service.

A distinctive feature of Northeastern University is its Cooperative Plan, under which students alternate periods of work and study. The Plan was initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922), Liberal Arts (1935), Education (1953), Pharmacy (1962), Nursing (1964), Boston-Bouvé College (1964), and the College of Criminal Justice (1967).

This time-tested method of education offers students the opportunity to gain valuable practical experience as an integral part of their college programs and also enables them to contribute substantially to the financing of their education. The "Co-op" Plan has been extended to the graduate level in engineering, mathematics, actuarial science, the pharmaceutical sciences, and professional accounting.

In the field of adult education, Northeastern University offers graduate and undergraduate degree programs and non-credit programs which are specifically designed to meet the needs and interests of adults who wish to further their education on a part-time basis.

All formal courses of study leading to degrees in the Graduate Division, Lincoln College, and University College are approved by the undergraduate faculties concerned, and are governed by the same qualitative and quantitative standards as the regular day curricula. Courses are scheduled in the day and evening at the Boston Campus, Suburban Campus in Burlington, and at other off-campus locations near Boston.

UNDERGRADUATE COLLEGES

BOSTON-BOUVÉ COLLEGE

Boston-Bouvé College offers three major programs of study: physical education and recreation education, both leading to the degree of Bachelor of Science in Education; and physical therapy, leading to the degree of Bachelor of Science in Physical Therapy.

The combined programs of liberal arts, science, and professional preparation include field experience and student teaching as well as leadership training in camping and outdoor education at the Warren Center for Physical Education and Recreation in Ashland. In accordance with Northeastern's Cooperative Plan of Education, students are offered varied opportunities for alternate terms of work-study experience during upper-class years.

COLLEGE OF BUSINESS ADMINISTRATION

The College of Business Administration offers programs of study in the principal fields of business leading to the Bachelor of Science degree in Business Administration. These programs are offered on the five-year Cooperative Plan, under which students gain substantial practical experience as an integral part of their undergraduate course of study.

The College also sponsors a Center for Management Development, which annually conducts an intensive program designed to provide professional growth for middle management executives. The plan of instruction, based on a modification of the Northeastern Cooperative Program, permits the participants to maintain their job responsibilities during the six-month period of the course. The Management Development Program is conducted at Andover, Massachusetts, on the campus of Andover Academy.

The Bureau of Business and Economic Research, concerned particularly with problems of the New England region, is an integral part of the College. The Bureau conducts research projects under faculty leadership using undergraduate and graduate cooperative students as research assistants.

COLLEGE OF CRIMINAL JUSTICE

The College of Criminal Justice offers a full-time day curricula on the Cooperative Plan leading to the degree of Bachelor of Science with concentration in the field of law enforcement.

COLLEGE OF EDUCATION

The College of Education offers programs leading to the degree of Bachelor of Science in Education. These are designed to prepare students for teaching or administrative positions in elementary and secondary schools. Curricula are offered on the five-year Cooperative Plan, which provides employment in libraries, social service agencies, and school systems.

COLLEGE OF ENGINEERING

The College of Engineering offers five-year cooperative curricula in civil, mechanical, electrical, chemical, industrial, and biomedical engineering leading to the degree of Bachelor of Science with specification according to the engineering department in which the student qualifies. A six-year program in power systems engineering in collaboration with public utilities leads to both the bachelor's and master's degree in electrical engineering. The College also offers during evening hours part-time programs leading to Bachelor of Science degrees in Civil and Electrical Engineering. These programs extend over eight years, cover the identical courses given in the day cooperative curricula, and meet the same qualitative and quantitative standards of scholarship.

COLLEGE OF LIBERAL ARTS

The College of Liberal Arts offers majors in the arts and sciences leading to the Bachelor of Arts degree. With the exception of preprofessional programs, curricula are normally five years in length and operate on the Cooperative Plan.

LINCOLN COLLEGE

Lincoln College offers associate and bachelor degree programs in the evening on a part-time basis. Programs of study include Allied-Medical Technology, Civil Engineering Technology, Electrical Engineering Technology, Industrial Technology, Mechanical Engineering Technology, and Science Technology. Lincoln College and University College offer joint programs leading to the Bachelor of Science degree in Industrial Technology, Medical Technology, Chemical-Biological Technology, and Cyto-technology.

In addition to its traditional curricula, Lincoln College offers interdisciplinary and certificate programs providing technological and professional development opportunities to meet the special needs of part-time students.

COLLEGE OF NURSING

The College of Nursing offers two separate and distinct programs of study, both organized on the Cooperative Plan:

- (a) A three-year curriculum in preparation for the R.N. Examinations, and leading to the Associate in Science degree.
- (b) A five-year curriculum in preparation for the R.N. Examinations, and leading to the Bachelor of Science degree in Nursing.

Five of Boston's leading hospitals—Beth Israel, Children's Hospital Medical Center, New England Deaconess, Peter Bent Brigham, and Massachusetts General—collaborate with Northeastern by providing suitable cooperative work opportunities during the students' upper-class years in these programs.

COLLEGE OF PHARMACY

The College of Pharmacy offers five-year cooperative curricula leading to the degree of Bachelor of Science in Pharmacy. Cooperative placement begins with the sophomore year and continues for three years, with the senior year devoted to full-time study at the University.

UNIVERSITY COLLEGE

University College, so called because it draws upon the resources of the other colleges of the University, offers part-time programs in Liberal Arts, Business Administration, Law Enforcement and Security, and Health-Related Programs, leading to the Associate in Science and Bachelor of Science degrees. Workshops and seminars are offered for degree credit. University College does not duplicate the offerings of the day colleges, but provides curricula which cut across traditional subject-matter areas to meet the particular needs of adult students.

In collaboration with Lincoln College, University College offers programs in Allied-Medical Technology and Science Technology leading to the Bachelor of Science degree. In cooperation with the Forsyth School for Dental Hygienists, University College offers a two-year day curriculum leading to the Associate in Science degree.

Students may enroll as degree candidates or elect single courses appropriate to their needs and interests. Courses are scheduled in the day and evening at the Boston Campus, Suburban Campus in Burlington, and other off-campus locations near Boston.

GRADUATE SCHOOLS

ACTUARIAL SCIENCE

Master of Science in Actuarial Science.

ARTS AND SCIENCES

Master of Arts, Master of Science; Ph.D. in Biology, Chemistry, Mathematics, Physics, and Psychology.

BUSINESS ADMINISTRATION

Master of Business Administration.

EDUCATION

Master of Education.

ENGINEERING

Master of Science with course specification, including a special six-year program in Power Systems Engineering leading to both bachelor's and master's degrees in Electrical Engineering; a similar six-year program in Mechanical Engineering leading to both bachelor's and master's degrees; and Ph.D. in the fields of Electrical, Chemical, and Mechanical Engineering.

LAW

Juris Doctor.

PHARMACEUTICAL SCIENCES

Master of Science with specialization in Hospital Pharmacy, Industrial Pharmacy, Medicinal Chemistry, and Pharmacology.

PROFESSIONAL ACCOUNTING

A five-quarter curriculum leading to the degree of Master of Science in Accounting.

DAY PROGRAMS FOR ADULTS

These programs were developed to meet the needs of adults with family or other obligations who wish to engage in part-time study during the day. Non-credit courses and undergraduate and graduate degree programs are offered at the Boston and Burlington campuses. Included are courses from the Graduate School of Education, the Graduate Schools of Arts and Sciences, University College, and the Center for Continuing Education. A Human Relations and Adult Counseling Program is also offered.

CENTER FOR CONTINUING EDUCATION

The Center for Continuing Education was established to relate the University to the needs of its community in a period of accelerated change. Its programs are composed of seminars, conferences, institutes, forums, and a wide variety of special courses designed to serve specific needs. The Division of Special Programs, working cooperatively with trade associations and professional societies, offers several programs dealing with current needs and problems. Through its Division of Community Services, working with governmental agencies and community organizations, the Center is becoming increasingly involved in social problems on both the local and national level.

Many of these programs are conducted at Henderson House, Northeastern University's conference center in Weston, Massachusetts.

AFFILIATED PROGRAMS

FOR DENTAL HYGIENISTS

The Forsyth School for Dental Hygienists conducts a two-year program of dental hygiene education and general education in cooperation with Northeastern University. Graduates of the program receive the Certificate in Dental Hygiene from Forsyth and the degree of Associate in Science from Northeastern University. After receiving the Associate degree, students may pursue the Bachelor of Science degree from University College on a part-time basis.

FOR MEDICAL TECHNOLOGISTS AND CYTOTECHNOLOGISTS

In cooperation with the New England Baptist and the New England Deaconess Hospitals, Northeastern University offers a full-time day program on the Cooperative Plan leading to the degree of Bachelor of Arts.

Bachelor of Science degree programs in Medical Technology and Cytotechnology are offered jointly on a part-time basis by Lincoln College and University College in cooperation with several approved hospital schools.

FOR NURSES

Northeastern University offers instruction in the sciences, humanities, and social studies for student nurses from the New England Deaconess and Children's Hospital Medical Center Schools of Nursing.

RESEARCH ACTIVITIES

The faculties of the University are engaged in a wide variety of basic research projects in business, science, social science, pharmacy, and engineering. These are coordinated by the Dean of Research, whose services are University-wide and available to the faculties of all the Colleges.

Although Northeastern is primarily concerned with undergraduate and graduate instruction, the University believes that the most effective teaching and learning takes place in an environment characterized by research activities directed toward extending the frontiers of knowledge.

buildings and facilities

The main campus of Northeastern University is located at 360 Huntington Avenue in the Back Bay section of Boston. Many of the city's famous cultural, educational, and philanthropic institutions are situated in the Back Bay, including the Museum of Fine Arts, Symphony Hall, Horticultural Hall, the Isabella Stewart Gardner Museum, the Harvard teaching hospitals, and many schools and colleges. Most are within walking distance of Northeastern University.

Major transportation facilities serving the Boston area are Logan International Airport, two rail terminals, bus terminals serving inter- and intrastate lines, and MBTA subway-bus service within the metropolitan-suburban area. There is a subway stop in front of the campus. For motorists, the best routes to the campus are the Massachusetts Turnpike (Exit 22) and Route 9, of which Huntington Avenue is the intown section.

The campus of 47 acres is divided by Huntington Avenue, with the main educational buildings on one side and dormitories on the other. The principal buildings, all of which have been constructed since 1938, are of glazed brick in contemporary classic style. Most are interconnected by underground passageways.

CARL S. ELL STUDENT CENTER

The Carl S. Ell Student Center provides facilities for student recreation and for extracurricular activities. The Alumni Auditorium, with a seating capacity of 1,300, is part of the Center. Also included are special drama facilities, a ballroom, main lounge, fine arts exhibition area, student offices, conference rooms, and a dining area seating more than 1,000.

THE UNIVERSITY LIBRARY

The Dodge Library is the main library on the Boston campus and maintains an open-stack system. Bound volumes in the library system exceed 190,000, and microfilm titles, 250,000. Collections are located in these areas:

1. The General Collection in the book stacks as indicated by the classification number given in the upper left corner of the catalog card.
2. The Reference Collection in the Cabot Reading Room to the left of the Circulation Desk, which includes bibliographies, government documents, maps, company publications, the information file, association publications, and theses.

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3. The Periodical Collection on the basement level occupying the lower Reading Room and the first two back-stack levels.
4. The Reserve Book Collection adjacent to the Periodical Room on the basement level.
5. The Foreign Literature Collections in the Webster Reading Room to the right of the Circulation Desk.
6. The Audio-Facility Division consisting of sound recordings and magnetic tapes for instructional and individual use in the Richardson Room on the second floor.
7. The American and English Literature Collections in the new Literature Reading Room.
8. The Humanities Collection (Philosophy, Psychology, Religion) in Rooms 202 and 203.
9. The Microtext Collection housed on the basement level adjacent to the Periodical Room. This collection includes 300,000 titles in microprint, microfilm, and microfiche forms.

The Card Catalog is a union list of materials in the University Library and is located in the Webster Reading Room.

The Circulation Department has an IBM card file of all students attending the University. To borrow materials, students should present university identification at the Circulation Desk. For extensive research, where it is not possible for the University Library to acquire materials, the inter-library loan system allows the acquisition of items from other collections throughout the country.

Library Hours—Boston Campus

Monday — Thursday	7:45 a.m. to 10:00 p.m.
Friday	7:45 a.m. to 7:30 p.m.
Saturday	8:30 a.m. to 4:00 p.m.

The reading rooms on the second floor are open until 1 a.m., Monday-Friday. The library is open Sundays and holidays from 1:00 to 10:00 p.m.

The University Library System includes two libraries in the Division of Research. Physics-Electrical Engineering is housed in 325 Dana Research Center and Chemistry-Mathematics is housed on the fifth floor of the United Realty Building.

Library Hours—Suburban Campus, Burlington

Monday — Friday	8:30 a.m. to 9:00 p.m.
Saturday	8:30 a.m. to 1:00 p.m.

SUBURBAN CAMPUS

The Suburban Campus, located near the junction of Routes 128 and 3 in Burlington, Massachusetts, was established to meet the needs of individuals and of industry in the area.

In addition to graduate courses in engineering, physics, mathematics, business administration, science, education, and the arts, portions of undergraduate programs leading to the associate and bachelor's degrees, special programs for adults, and non-credit state-of-the-art programs are offered.

HENDERSON HOUSE

The University's conference center, Henderson House, is located in Weston, Massachusetts. The Center for Continuing Education conducts short-term courses, seminars, and special institutes for business, professional, and research groups. Henderson House is 12 miles from the main campus.

WARREN CENTER

The Warren Center for Physical Education and Recreation in Ashland, Massachusetts, serves as a year-round outdoor laboratory for students in Boston-Bouvé College. There are facilities for conferences, special education in arts and crafts, and sports, including aquatics. Buildings include a lodge, cottages, and an infirmary.

MARINE SCIENCE INSTITUTE

The Marine Science Institute at Nahant, Massachusetts, about 20 miles northeast of Boston, is a research and instructional facility primarily engaged in studies of marine biology and oceanography. The Institute is operated the year around.

university college

The Programs

University College is committed to the education of mature, adult students who wish to live effectively in today's complex society. The programs in University College are specifically designed to satisfy the changing professional, cultural, and social needs and interests of adults.

Degree programs have been developed in 30 major fields of study in the areas of business administration, liberal arts, law enforcement, and health-related programs. Flexible curricula are offered on a part-time basis Monday through Saturday during day and evening hours convenient to adult students. Students may elect single courses or may enroll in full degree programs leading to the Associate in Science or the Bachelor of Science degree. Short-term seminars are also offered for credit. Classes are scheduled in locations which are accessible to the urban and the suburban community. Students may attend classes at the Huntington Avenue Campus, Boston, or the Suburban Campus, Burlington, Massachusetts, as well as other off-campus locations north and west of Boston.

University College programs are constantly evaluated and redesigned when necessary in order to keep pace with the changing needs and interests of its students and the community.

The Faculty

Approximately 600 men and women comprise the part-time teaching staff of University College. Included are members of the full-time faculty of the Basic Colleges of Northeastern University and other educational institutions in New England, as well as outstanding New England business and professional leaders with backgrounds of training and experience in specialized areas. The faculty are selected because they are highly successful in their fields and are well qualified to provide sound methods of teaching for adults in an interesting, inspiring, and effective manner.

The Student Body

The student body of University College represents diversified interests which properly recognized and utilized become one of the basic strengths in adult education. There are approximately 12,000 students in University College who range in age from 18 years to beyond retirement. While some students enroll in University College immediately after high school graduation, others may have graduated 25 years prior to enrollment in college-level courses.

University College students are men and women who have full-time commitments to their jobs, families, or other responsibilities. They may enroll in a single course or in a full degree curriculum, depending on whether their goal is job advancement, a new career, or personal enrichment.

academic policies

Admission

All applicants who satisfy the requirements for regular or special students as listed below are admitted as part-time students in University College. It is advisable for students to have an interview with an Admissions Counselor to help plan their academic program in University College. Because of the diversity of the student body in terms of background, age, interests, needs, etc., there are no entrance examinations and college board examination scores are not required. In lieu of entrance examinations, students must maintain a C average in order to be admitted to degree candidacy.

Regular Students

To be enrolled as a regular student, that is, to become a degree candidate, the applicant must have completed an approved secondary school course, or the equivalent 15 units* of a high school diploma. Equivalency certificates are accepted. Regular students are those students who expect to follow a degree program.

Special Students

Special students are those students who do not wish to enroll in a full degree program, but are interested in taking only one or more courses appropriate to their needs or interests. Credits for these courses may be transferred to a degree program if the student decides to pursue a degree at a later time.

Procedure for Admission as a Degree Candidate

1. Upon completion of 40 earned quarter hours of credit, the student should officially petition for admission to the status of a degree candidate. Forms for this purpose are available in the University College Office, 219 Hayden Hall.
2. If a student has completed 40 quarter hours of credit in University College, he cannot register for any more courses unless he has been officially accepted as a degree candidate.

*A unit represents a year's work in any subject in any approved secondary school constituting approximately a quarter of a full year's work, or the equivalent. A four-year day high school course is regarded as representing at least 15 units of work, or 3 units in junior high school and 12 units in a three-year high school.

3. In order to be matriculated as a degree candidate, the student must have a high school diploma or its equivalent and must achieve a cumulative quality point average of 2.00 (an average grade of C) for all courses completed before filing the petition.
4. The Committee on Education may require a student to take one or more aptitude or interest tests if his credentials or academic record fail to give evidence of probable academic success. In this case the student will be notified in writing that arrangements for testing should be made by him with the University Counseling and Testing Center. A fee is charged for administering these tests.

Advanced Standing Credit

Advanced standing credit in University College may be obtained in two ways:

By Transfer of Credit from Another Institution

Subject to approval by the Director of Admissions, credit may be granted for work completed in other approved schools, colleges, or universities. An applicant who wishes to receive credit by transfer should indicate his desire when he applies for admission. He should write to the Registrar of the institution previously attended and request that an official transcript be sent to the Director of Admissions in University College. The transcript indicates honorable dismissal, courses completed, credits and grades received. The transcript should be sent well in advance of the registration period. The applicant should inform the Director of Admissions of his major field of interest so that the transcript will be evaluated appropriately.

Students who have been dismissed from another institution for academic reasons must accompany their application with a statement from the dean or other appropriate official of their previous institution setting forth the reasons for dismissal or probationary status with recommendation for continued study. All applicants will be considered on their own merits.

By Examination

1. For Credit: No advanced standing credit is awarded except for work previously completed in courses comparable to those offered in University College or compatible with the objective of the student's curriculum. Credit may be disallowed for work previously completed due to the remoteness of the time of study; however, these applicants will be granted the privilege of taking an examination for credit.

2. For Placement: Applicants who, as a result of previous training and experience, may be considered to possess sufficient knowledge of a subject will be allowed the privilege of taking a special examination in particular courses.

The grade of B or better must be obtained in any examination taken for placement.

In all cases students admitted by transfer or advanced standing credit from any other institution must meet the requirements for matriculated status as set forth under the regulations applicable to regular students.

Residence Requirement

Every candidate for the baccalaureate or associate degree must fulfill the residence requirement. The residence requirement is defined as the satisfactory completion in University College immediately preceding graduation of 46 consecutive quarter hours of work in course, with the further provision that at least 12 of the 46 quarter hours must be in the candidate's major field. All programs to meet the residency requirement must have the approval of the Dean. Students whose attendance in degree programs is interrupted for a period of one year or more will be reinstated into the program in effect at the time of their re-entry into University College.

In the case of students who for causes beyond their control move outside of the reasonable commuting area of the College, and who have completed 134 or more quarter hours of credit in course, the Committee on Education will entertain a petition to allow them the privilege of completing their degree requirements at some other approved college. Under no circumstances will a degree be awarded to any student who has completed less than 46 quarter hours of credit in courses in University College.

Quality Requirement for Graduation

A cumulative quality point average of 2.00 (an average grade of C) is required for graduation. Advanced standing credits are not averaged in the cumulative score.

Graduation with Honor

Candidates who have achieved distinctly superior attainment in their academic work will be graduated with honor. Upon special vote of the faculty a limited number of this group may be graduated with high honor or with highest honor. To be considered for graduation with honor, a student must have completed a minimum of 72 quarter hours of work at University College. Courses credited by advanced standing will be eliminated in determining honor graduates.

Attendance at Commencement

All candidates for University College degrees are required to attend Commencement in the year of qualification. Degrees in absentia are awarded only to candidates excused for personal or immediate-family illness, military service, or employment obligations which are beyond the control of the candidate.

A petition to receive a degree in absentia must be presented to the Dean. Each petition will be acted upon by the Dean.

Quality Points

The requirement for graduation from University College is 174 quarter hours with attainment of a quality point average of 2.00. Although the credits allowed for acceptable work completed elsewhere by transfer students count toward fulfillment of quantitative graduation requirements, neither the credits nor the grades earned in such courses are included in quality point computations for graduation.

The method of figuring quality points is as follows: Each quarter hour credit of A grade is multiplied by 4, B grade by 3, C grade by 2, D grade by 1, and F grade by 0. The total number of quality points, divided by the total number of quarter hour credits completed, shall be the quality point average.

Students receiving an F grade in a required course must repeat the course in its entirety including term work, examinations, and attendance.

Quality Point Averages

The Registrar's Office will not be able to recalculate or confirm the calculations of quality point averages for individual students. Each student's record will be brought up to date before his graduation. In the meantime, borderline cases will be checked by the Director of Admissions of University College.

Canceled Classes

University College reserves the right to cancel, postpone, or combine classes when necessary.

Registration

Before attending classes, students must report to the registration area to register. All students must complete their registration properly before attending class.

No academic credit will be recorded for students not properly registered. In order to insure academic success, students are strongly advised to adhere to course prerequisites.

Class Attendance and Preparation

Students are expected to attend all exercises in the subjects they are studying unless excused in advance.

Absence from regularly scheduled exercises in any subject will seriously affect the standing of the student. Consecutive absences may cause the removal of the subject or subjects from the student's schedule.

Two hours of preparation are normally required for each hour spent in the classroom.

Withdrawals

Simply ceasing to attend classes or notifying the instructor does not constitute official withdrawal. To withdraw from a course, the Registrar's Office must be notified by the student and the appropriate withdrawal form filled out.

Change of Address

Change of address and/or name should be reported immediately to the Registrar's Office.

Absence Because of Illness

All students who are absent from school because of extended illness should inform the Registrar's Office by letter, message, or phone call.

Examinations

Term tests are scheduled in each quarter at the option of the instructor and are regarded as part of the term's course work. A final examination will be held at the end of each quarter in each course unless an announcement to the contrary is made.

Homework Assignments

Students are responsible for obtaining their homework assignments by contacting their instructor or another student in their class. Homework assignments are not available in the University College Office.

Missed Final Examinations

A student does not automatically have the right to make up a missed final examination. Students must petition for this privilege. If the petition is granted, the student must pay a fee of \$5.00 for taking the special final examination. Petitions may be obtained from the Registrar's Office or in each off-campus Administration Office. Petitions for missed finals must be filed in accordance with the schedule listed below:

final examination missed during:	file petition no later than:	make-up final examination during week of:
Fall Quarter	Dec. 21, 1968	Jan. 20, 1969
Winter Quarter	Mar. 29, 1969	April 21, 1969
Spring Quarter	June 28, 1969	July 21, 1969
Summer Quarter	Sept. 27, 1969	Oct. 20, 1969

Students will be notified by mail when and where to take the missed final examination. All examinations will be administered on the Boston Campus.

Students who do not take make-up final examinations as scheduled forfeit the make-up privilege.

Grading System

The following system of grading is used. The numerical equivalent for each grade is in parentheses.

A (4.0) — Outstanding	D (1.0) — Poor
B (3.0) — Good	F (0.0) — Failure
C (2.0) — Satisfactory	I (—) — Incomplete

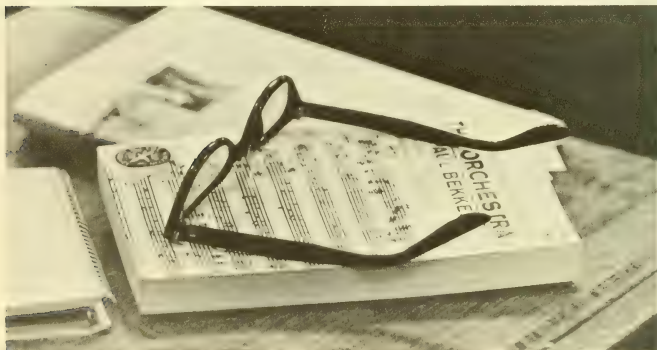
A general average of "D" is unacceptable and will not allow a student to continue in University College or to receive a degree from Northeastern University. The "F" grade is a definite failure and requires repetition of course in its entirety. The "I" grade is given only when the student fails to take the final examination.

Grade Reports

An official University College grade report will be mailed to each student legitimately enrolled in courses approximately three weeks after the quarter is completed. Grades will not be given over the telephone or at the Registrar's Office.

Calculation of Quality Point Average

1. When the student has more than one grade in the same course, the most recent grade will be used in the calculation of the quality point average.
2. A grade of "I" will not be considered in the calculation of the quality point average.
3. Although advanced standing credits (ASC) allowed for acceptable work completed at other institutions by transfer students count toward completion of the quantitative credit requirements, neither the credits nor the grades earned in such courses are included in quality point average computations.



For example, a student who has registered for seven courses, cleared a failure in one of them and received advanced standing credit (ASC) in another, may calculate his quality point average as follows:

Grade Achieved	Numerical Equivalent	Credit Hours	Quality Points
A	4.0	× 4	= 16.0
B	3.0	× 4	= 12.0
C	2.0	× 3	= 6.0
D	1.0	× 3	= 3.0
F	0.0	× 2	= 0.0
F B	3.0	× 2	= 6.0
I	—	× —	= —
ASC	—	× —	= —
		Totals	18 43.0

$$\text{Quality Point Average} = \frac{\text{Total Quality Points (43.0)}}{\text{Total Credit Hours (18)}} = 2.389$$

Academic Probation

Students whose scholarship in any given period is unsatisfactory may be dropped from the College or may be placed on probation.

Disciplinary Probation

The Committee on Education has the authority to dismiss from the College or place on probation at any time or to strike from the list of candidates for the degree, any student deemed unworthy because of conduct or character.

tuition and fees

Tuition and fees are refundable only as stated under "Refund of Tuition." Checks and drafts for all charges are to be drawn to the order of Northeastern University.

Initial Registration Fee

The University initial registration fee of \$10.00 is to be paid at the time of first billing. This fee is nonrefundable.

Tuition

Tuition for all credit courses is \$21.00 per quarter hour of credit. Charges for registration and tuition for special courses are at the rate and on the basis of payment specified for each course.

Tuition for all credit courses is charged on the quarter basis and is payable at the beginning of each quarter.

Students are not permitted to attend class sessions or take any examination or test until they have paid their tuition fees or have made satisfactory arrangements for payment.

Students will not be advanced in class standing, or permitted to re-enroll in the University, nor will degrees be conferred until all financial obligations to the University have been met.

No certificate of honorable dismissal will be issued to any student who has not fully met his financial obligations to the University.

Tuition Budget Payment Plans

Occasionally situations develop—usually beyond the control of the student—which make it difficult to meet the payments in the manner outlined above. Under such circumstances the student is advised to discuss his problem personally at the Bursar's Office, where one of the budget plans or a deferred payment agreement may be worked out. Such arrangements should be made before the end of the first week of the quarter or within one week of the date of registration if the student enters late. A charge of \$2.00 will be made. Failure to take immediate action will result in a late payment fee of \$5.00.

Tuition Underwritten by Employers

An increasing number of companies are underwriting part or all of the cost of tuition of students in their employ. In cases where payment is to be made directly by the employer to the University, the student should furnish to the Bursar's Office a purchase order covering his registration or a statement from an officer of his company certifying that the company is underwriting the tuition.

Veterans' Benefits

Any veteran covered by Public Law 89-358 should report to Room 245 Richards Hall to fill out the proper enrollment forms.

Late Payment Fee

Bills for tuition and fees are payable on or before Saturday of the week of issuance. A late payment fee of \$5.00 is charged for all students failing to comply unless special payment arrangements are approved by the Bursar's Office.

Refund of Tuition

The general policy in all schools and colleges of the University with respect to refunds of tuition to students is as follows:

The University provides all instruction on an academic quarter basis for which students pay at the beginning of each quarter. Tuition refunds will be granted through the first four weeks of a quarter only when specific conditions are met. Questions regarding refunds should be discussed with the Bursar.

Tuition refunds will be granted only on the basis of the date appearing on the official withdrawal application when filed with the Registrar in Room 120 Hayden Hall. Non-attendance does not constitute official withdrawal.

Refunds will be granted in accordance with the following schedule:

official withdrawal filed within:	percentage of tuition
1st week of quarter	100%
2nd week of quarter	75%
3rd week of quarter	50%
4th week of quarter	25%

Courses in Other Departments of the University

University College students assigned to courses in other departments of the University are charged the tuition rates and other fees effective in the departments in which they are enrolled.

Student Center Fee

All students in University College on the Huntington Avenue Campus are charged \$.75 each quarter for the services available in the Student Center.

Graduation Fee

The University graduation fee, charged to those who are candidates for the baccalaureate or associate degree, is \$25.00 payable on or before May 1 of the year in which the student expects to graduate.

Transcripts

Students may request transcripts of their grades at the Registrar's Office. There is no charge for the first transcript. After the initial transcript, there is a charge of \$1.00 per copy, payable in advance. If more than one transcript is requested at one time, the charge is \$1.00 for the first copy and \$.50 for each additional copy.



scholarships, awards and loan funds

The following scholarships and awards are available to students enrolled in University College.

Professor Joseph A. Mullen Scholarships

The Massachusetts Chapter of the American Society of Training and Development has established a fund to provide annual scholarship awards to deserving part-time students upon the recommendation of the Dean of University College.

Dean Russell Whitney Memorial Scholarship

Alpha Chapter of the Pi Tau Kappa Fraternity sponsors an annual tuition scholarship in memory of former Dean Russell Whitney. The award is made available to the man in University College whose qualities of leadership and influence on his fellow students, strength of character, and record of scholarship and broad achievement mark him as outstanding. The award is made available to the student who has completed a minimum of 80 quarter hours. To be eligible for this scholarship, the student must pursue a normal schedule during the year in which the award is made.

Kappa Tau Phi Scholarships

Kappa Tau Phi Sorority annually makes available scholarship awards. They are granted to women students in the liberal arts, business, and engineering programs, respectively, who rank highest in their class at the end of the upper-middler year. In the event the student is eligible for an award of greater monetary value, the award will be made to the next highest-ranking woman student. To be eligible for this scholarship, the student must be enrolled in a program of at least two evenings per week and must be a candidate for the Bachelor's degree. In determining this award, grades of all courses completed in prior years shall be considered.

Harry Olins Scholarship

The Harry Olins Scholarship Fund was established as an expression of firm belief in University College students and "what they stand for." The fund, presented by Mrs. Harry Olins in recognition of her husband's long service on the faculty makes available an annual tuition award to two students who in terms of scholastic achievement, character, and personal need best typify the spirit of Northeastern University.

To be eligible for this award, the student must be a degree candidate and carry a full academic load during the school year.

Pilot Freight Carriers Scholarships

Pilot Freight Carriers, Winston-Salem, North Carolina, awards \$500 annually to advanced transportation students who have achieved high academic standing and who have paid their tuition expenses without prior aid. The award may be shared by more than one student. Potential recipients are designated by the Director of the Transportation Institute, and a final determination is made by the Dean of University College.

University College Faculty Club Memorial Scholarship Awards

The Faculty Club of University College, Northeastern University, offers two awards annually, primarily for excellence in studies, to Bachelor of Science degree candidates in University College who have carried, and are currently carrying, a minimum of 24 quarter hours (the equivalent of 16 semester hours) for the academic year.

These awards shall be known as University College Faculty Club Memorial Scholarship Awards in commemoration of the Club's deceased members.

Traffic Club of New England Scholarship

The Traffic Club of New England provides 12 basic and four advanced scholarships annually for persons employed in transportation and industry traffic departments. The scholarships are divided equally between industry and carrier applicants, and each award is applicable toward tuition, books, and incidental expenses involved in Transportation Management courses. The purpose of the plan is to afford a limited number of young men an opportunity to expand and improve their education by systematized study in courses in the field of transportation and traffic management. The scholarships are administered cooperatively with the Scholarship Committee of the Traffic Club of New England. Applications may be secured from and filed with the Secretary, The Traffic Club of New England, 294 Washington Street, Boston, Massachusetts 02108.

Sigma Epsilon Rho Scholarships

University College's scholastic honor fraternity, Sigma Epsilon Rho, annually awards plaques and scholarships for outstanding scholastic achievement to the highest-ranking male students in University and Lincoln Colleges at the end of their junior year.

The Northeastern University Faculty Wives Scholarship

Each year the Faculty Wives Club of Northeastern University offers a scholarship to a young woman of limited financial resources who has demonstrated a likelihood of succeeding in her chosen professional field.

University Scholarships

Northeastern University has for many years maintained a scholarship fund for deserving, qualified students. These scholarships are awarded on the basis of need, scholastic standing, and campus citizenship. Applicants must complete the same form used for the National Defense Student Loan Program and file it with the Office of Financial Aid one month prior to the start of the quarter. All applications will be considered for all scholarship and loan programs administered by the University unless an applicant specifies otherwise.

National Defense Student Loan Program

Under the National Defense Education Act of 1958, a long-term loan program was established to provide financial assistance to students in need of such aid to continue their education. In 1964, this act was amended to permit participation by students carrying at least one-half of the normal full-time academic workload as determined by the University.

The maximum amount which may be borrowed in one academic year is \$1,000. The total of loans made to a student for all years, including any made to him as a graduate student, may not exceed \$10,000. The actual amount of any award will be determined by the financial position of the student and his family (if applicable) and the availability of funds. Preference is given to outstanding students.

Repayment of these loans begins nine months after the date on which the borrower ceases to carry, at an institution of higher education, at least one-half the normal full-time academic work load as determined by that institution. The repayment period extends ten years from that point and may be further extended by periods for which he is legally entitled to deferment.

Up to 50 per cent of any such loan (plus interest) shall be canceled for services as a full-time teacher in a public or private nonprofit elementary or secondary school and in institutions of higher education at a rate of 10 per cent (plus interest) for each complete academic year of service, or its equivalent. For services in a school district determined to have a high concentration of students from low-income families, the cancellation rate is 15 per cent for each complete year of service; and an additional 50 per cent of any loan (plus interest) may be canceled.

Additional information and application forms are available through the University College Office or from the Office of Financial Aid. For full-time students, the deadline for application is August 1, and for half-time students, one month prior to the start of the quarter for which aid is requested.

Guaranteed Loan Program

The major objective of this program is to make loan insurance available to any college student who wants to borrow. Under this program a student enrolled for at least one-half the normal academic work load may borrow from a bank or other financial institution. A graduate student may borrow as much as \$1,500 a year; an undergraduate, as much as \$1,000.

A student from a family with an adjusted income of less than \$15,000 a year pays no interest while he is in the University. Repayment of principal and interest begins when the student has ceased his course of study. At that time the Federal Government pays approximately one-half the interest and the student the remainder. A student from a family with an adjusted income higher than \$15,000 a year pays the entire interest on the loan, but he may borrow under the Guaranteed Loan Program at 6 per cent simple interest.

Students may obtain additional information and the necessary application forms from their local bank or other financial institution.



student activities

Student activities for part-time students are planned, organized and operated by the student body with the assistance of the Assistant Director of Student Activities. The programs are designed to keep pace with the changing needs of adult students and to provide maximum opportunity for student participation. All part-time students in University College, Lincoln College, and the Graduate Schools are welcome to participate.

The program is flexible in nature and pioneering in spirit to meet the needs of adult students. The Office of Student Activities is particularly interested in developing new clubs which will benefit students professionally and educationally. If students wish to start clubs related to their professions, this office will help them plan and organize clubs on the local and national level. The program is dedicated to assisting the adult student in the development of his fullest potential. The Student Activities Office is located in 254 Ell Student Center.

Purpose

The purposes of evening student activities are:

To encourage and reward scholarship.

To provide opportunities for the development and pursuit of cultural interests and professional objectives.

To encourage the development of leadership activities and skills.

To enable the student to identify more closely with the University.

To include the family, as an important and vital motivating force, in the evening student's educational career.

Society for the Advancement of Management

The Society for the Advancement of Management is the recognized national professional organization of managers in industry, commerce, government, and education. It has been dedicated to the advancement of management and managers since 1912, when the original Taylor Society was established. University chapters operate in 190 leading colleges and universities in the United States, Canada, Puerto Rico, and Hawaii.

The Northeastern University chapter is open to all adult students interested in furthering their growth and insight into the practice of the management profession.

The Northeastern University evening student chapter brings together business executives and students who are interested in the art and science of management. Meetings, conferences, and seminars provide an effective medium for the exchange and distribution of information on the problems, policies, and methods of management and industry.

Sigma Epsilon Rho Honor Fraternity

Sigma Epsilon Rho is the honor fraternity of University College. Its purposes are:

To promote acquaintance and good fellowship among those men who have attained highest scholastic standing in the College.

To stimulate the student body to higher scholastic accomplishment through the bearing, influence, and work of these selected men.

To develop methods of mutual improvement and advancement among the members of this fraternity.

To support high moral, professional, and scholastic ideals.

Only honor graduates or seniors with honor standing at the end of the junior year are eligible for admission to the fraternity. Admission is by invitation after nomination by the fraternity.

An outstanding book is awarded each year by Sigma Epsilon Rho Fraternity to the highest-ranking student at the conclusion of the junior year. Students will receive the award only in the event that they enroll for the subsequent year.

Pi Tau Kappa Fraternity

Pi Tau Kappa is a social fraternity open to all evening students. It is organized to further the interests of students in their education, to promote closer affiliation between the student and the University, and to promote the social welfare of the adult student.

Kappa Tau Phi Sorority

Kappa Tau Phi Sorority is a social organization open to all evening women students. Its purpose is to promote fellowship among the women students so that they may become better acquainted and form a closer tie with the University. Monthly dinner meetings are held. Two scholarships are awarded annually to scholastically superior women students.

Placement Service

Whenever students or graduates request the College to assist them in securing new opportunities for development or advancement, the College will endeavor to put them in touch with employers who may have asked the College to assist them in finding employees with the qualities and potential required. While the College cannot guarantee positions to either its undergraduates or graduates, it will do what it can to bring applicants and employers together to their possible mutual satisfaction. In the final analysis, placement depends largely on the applicant's ability to sell his services. Many manufacturing and commercial firms throughout New England call upon the College to assist them in filling positions at all levels.

No charge is made for placement service.

Alumni Association

More than 32,000 alumni are members of the all-University Alumni Association which has as its prime purposes the promotion of the welfare of Northeastern University, the establishment of a mutually beneficial relationship between the University and its alumni, and the perpetuation of fellowship among members of the Association.

The Association headquarters and Alumni Lounge are located in Rooms 225 and 226 Richards Hall, respectively. The official records and addresses of alumni are maintained in Room 20 of the Forsyth Annex.

The official publication of the Alumni Association, The Northeastern University ALUMNUS, is published quarterly and sent free of charge to all alumni on record.

Through its Vice President for the Alumni Fund, the Association co-operates with the Office of University Development in raising funds from alumni for the Diamond Anniversary Development Program.

Activities of the Association, including the Homecoming Day celebration and the annual presentation of Professional Promise Awards to outstanding seniors in each of the eight Basic Colleges, are directed by the Vice President for Alumni Affairs. Alumni officers also attend meetings of the undergraduate classes to form a closer relationship between the Association and its future members.

The Alumni Relations Office assists the various class officers in planning class reunions. Each class normally holds a reunion every five years during the month of June. The Vice President for the Alumni Class Council is responsible for coordinating class activities and organizing class functions.

The Vice President for Alumni Clubs works in close association with officers of the more than 40 Regional Alumni Clubs which have been established from coast to coast. All alumni are eligible to become members of these organizations. The alumni clubs meet periodically, often in conjunction with visits from members of the faculty or with athletic events.

For Boston area alumni, monthly luncheon meetings are held in both the downtown and uptown sections of the city.

The Association also sponsors and assists the alumnae organization, and the Varsity Club, both of which have their own officers and conduct various programs throughout the year. Through the Varsity Club, the Association presents trophies to the outstanding athlete of the year in each of the five major sports.

One of the most recent developments in alumni activities is the organization of seminars which are conducted by the Association in cooperation with the University's Center for Continuing Education. The seminars are designed particularly for alumni who have a special interest in current events and the field of adult education.

programs of study

University College conducts part-time educational programs at the undergraduate level during day and evening hours. The programs are designed to meet the varying needs and interests of adult students who may enroll as (1) *Regular* students following degree programs or as (2) *Special* students taking single courses or special programs.

University College programs leading to the Bachelor of Science degree provide opportunities for cultural and professional development equivalent in quality and scope to those offered in the conventional four-year college enrolling full-time students. The Bachelor of Science degree requires 174 quarter hours of credit.

Programs leading to the Associate in Science degree provide students a background in fundamental areas in business administration, liberal arts, health-related programs, and law enforcement. The Associate degree requires 96 quarter hours of credit and is equivalent to the conventional two-year, or junior, college in scope and quality.

Degree curricula are offered in the following areas:

BUSINESS ADMINISTRATION

Major	Degree	Page
Accounting	Bachelor of Science	46
	Associate in Science	48
Electronic Data Processing	Associate in Science	50
Finance	Bachelor of Science	52
	Associate in Science	54
Industrial Management	Bachelor of Science	56
	Associate in Science	58
Industrial Technology	Bachelor of Science	61
Insurance	Bachelor of Science	62
	Associate in Science	64
Management	Bachelor of Science	66
	Associate in Science	68
Management Information Systems	Bachelor of Science	70
Marketing	Bachelor of Science	72
	Associate in Science	74
Personnel and Industrial Relations	Bachelor of Science	76
	Associate in Science	78
Purchasing	Associate in Science	80
Real Estate	Associate in Science	82
Transportation Management	Associate in Science	84
Combined Program in Liberal Arts and Management	Bachelor of Science	86

LIBERAL ARTS

Major	Degree	Page
Economics	Bachelor of Science	91
English	Bachelor of Science	92
Fine Arts	Bachelor of Science	94
History	Bachelor of Science	96
Liberal Arts	Associate in Science	98
Political Science	Bachelor of Science	99
Psychology	Bachelor of Science	101
Sociology-Anthropology	Bachelor of Science	102

LAW ENFORCEMENT

Major	Degree	Page
Correctional Practices	Bachelor of Science	106
	Associate in Science	108
Law Enforcement	Bachelor of Science	110
	Associate in Science	112
Security	Bachelor of Science	114
	Associate in Science	116

HEALTH-RELATED PROGRAMS

Major	Degree	Page
Forsyth School—Northeastern University Affiliated Program		
Program for Dental Hygienists	Bachelor of Science	118
Health Care Administration		
Inhalation Therapy	Associate in Science	130
Management in Health Agencies and Institutions	Bachelor of Science	120
Medical Records Science	Bachelor of Science	124
	Certificate	126
Nursing Home Administration	Selected courses—no degree	122
Lincoln College—University College Affiliated Programs		
Chemical-Biological Technology	Bachelor of Science	134
Cytotechnology	Bachelor of Science	135
Medical Technology	Bachelor of Science	136

Course descriptions are listed in numerical order by department beginning on page 137.



business administration

Aims

Business Administration programs of study are offered to meet the needs of adult men and women who wish to acquire professional competence in their chosen field of business.

The Bachelor of Science degree is offered in the areas of Accounting, Marketing, Finance, Insurance, Management, Personnel and Industrial Relations, and Industrial Management. The Associate in Science degree is offered in Accounting, Marketing, Finance, Insurance, Management, Personnel and Industrial Relations, Industrial Management, Electronic Data Processing, Real Estate, and Transportation.

The degree programs in Business Administration are designed to build for the student both a breadth of perspective and a degree of specialization. The former is obtained through a strong and well-balanced sequence of Liberal Arts courses which emphasize our fundamental economic laws and the social and cultural foundations of American Society. The latter is obtained by a study of the basic business courses in addition to a concentrated study in the major business area selected by the student.

Requirements

The Bachelor of Science Degree

In general, the Bachelor of Science degree in Business Administration requires successful completion of the following areas of study:

	quarter hours
Basic Courses	36
Additional Courses	24
Core Courses	54
Major Concentration Courses and Electives	60
Total Quarter Hours required for Bachelor of Science Degree	<u>174</u>

The Associate in Science Degree

To qualify for the Associate in Science degree in Business Administration, the following areas must be successfully completed:

	quarter hours
Basic Courses	36
Core Courses	30
Major Concentration Courses and Electives	30
Total Quarter Hours required for Associate in Science Degree	<u>96</u>

Detailed information about these programs together with a recommended sequence for completing them appears on the following pages.

ACCOUNTING**Bachelor of Science Degree**

quarter hours

Basic Courses—required

10.501,	10.502,	10.503	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
30.504,	30.505,	30.506	English I, II, III	6	
30.507,	30.508,	30.509	Introduction to Literature I, II, III	6	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	36
				—	

Additional Courses—required

16.501,	16.502,	16.503	Natural Science I, II, III	6	
21.501,	21.502,	21.503	Sociology I, II, III	6	
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6	
			Art, Music, or Theatre Arts	6	24
				—	

Core Courses—required

39.511,	39.512,	39.513	Statistics I, II, III	6	
41.501,	41.502,	41.503	Accounting Principles I, II, III	6	
43.501,	43.502,	43.503	Introduction to Marketing I, II, III	6	
44.501,	44.502,	44.503	Capital Institutions and Risk Management I, II, III	6	
44.507,	44.508,	44.509	Corporate Finance I, II, III	6	
45.501,	45.502,	45.503	Management and Organization I, II, III	6	
		45.510	Labor-Management Relations	2	
	45.511,	45.512	Human Relations in Personnel I, II	4	
45.541,	45.542,	45.543	Law I, II, III	6	
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6	54
				—	

Major Concentration Courses—required

41.504,	41.505,	41.506	Accounting—Intermediate I, II, III	6	
41.507,	41.508,	41.509	Accounting—Cost I, II, III	6	
41.510,	41.511,	41.512	Accounting—Advanced I, II, III	6	
41.513,	41.514,	41.515	Accounting—Specialized Problems I, II, III	6	
41.516,	41.517,	41.518	Auditing I, II, III	6	
41.519,	41.520,	41.521	Federal Income Taxes I, II, III	6	
41.522,	41.523,	41.524	Seminar in Contemporary Accounting Problems I, II, III	6	42
				—	

Electives**18****Total Credits****174**

Students following a degree program should refer to the suggested course sequence on the opposite page.

ACCOUNTING

**Recommended Course Sequence for the 8-Year Program
Leading to the Bachelor of Science Degree**

	Quarter 1	Quarter 2	Quarter 3
1st Year	English I Acctg. I Mgmt. & Org. I	English II Acctg. II Mgmt. & Org. II	English III Acctg. III Mgmt. & Org. III
2nd Year	Econ. I Cap. Inst.— Risk Mgmt. I Math. I Inter. Acctg. I	Econ. II Cap. Inst.— Risk Mgmt. II Math. II Inter. Acctg. II	Econ. III Cap. Inst.— Risk Mgmt. III Math. III Inter. Acctg. III
3rd Year	Lit. I Law I Intro. Mktg. I Adv. Acctg. I	Lit. II Law II Intro. Mktg. II Adv. Acctg. II	Lit. III Law III Intro. Mktg. III Adv. Acctg. III
4th Year	Nat. Sci. I Stat. I E. D. P. I Acctg. Spec. Prob. I	Nat. Sci. II Stat. II E. D. P. II Acctg. Spec. Prob. II	Nat. Sci. III Stat. III E. D. P. III Acctg. Spec. Prob. III
5th Year	West. Civ. I Sociology I Corp. Fin. I Cost Acctg. I	West. Civ. II Sociology II Corp. Fin. II Cost Acctg. II	West. Civ. III Sociology III Corp. Fin. III Cost. Acctg. III
6th Year	Phil. I Psych. I Lab.-Mgmt. Rel. Audit. I	Phil. II Psych. II Human Rel. I Audit. II	Phil. III Psych. III Human Rel. II Audit. III
7th Year	Art, Music Fed. Inc. Tax I Elective Elective	Art, Music Fed. Inc. Tax II Elective Elective	Art, Music Fed. Inc. Tax III Elective Elective
8th Year	Seminar I Elective	Seminar II Elective	Seminar III Elective

ACCOUNTING**Associate in Science Degree**

quarter hours

Basic Courses—required

10.501,	10.502,	10.503	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
30.504,	30.505,	30.506	English I, II, III	6	
30.507,	30.508,	30.509	Introduction to Literature I, II, III	6	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	36
				—	

Core Courses—required

39.511,	39.512,	39.513	Statistics I, II, III	6	
41.501,	41.502,	41.503	Accounting Principles I, II, III	6	
44.501,	44.502,	44.503	Capital Institutions and Risk Management I, II, III	6	
45.501,	45.502,	45.503	Management and Organization I, II, III	6	
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6	30
				—	

Major Concentration Courses—required

41.504,	41.505,	41.506	Accounting—Intermediate I, II, III	6	
41.507,	41.508,	41.509	Accounting—Cost I, II, III	6	
41.510,	41.511,	41.512	Accounting—Advanced I, II, III	6	
41.516,	41.517,	41.518	Auditing I, II, III	6	
41.519,	41.520,	41.521	Federal Income Taxes I, II, III	6	30
				—	

Total Credits**96**

Students following a degree program should refer to the suggested course sequence on the opposite page.

ACCOUNTING**Recommended Course Sequence for the 4-Year Program
Leading to the Associate in Science Degree**

	Quarter 1	Quarter 2	Quarter 3
1st Year	English I Acctg. I Mgmt. & Org. I Math. I	English II Acctg. II Mgmt. & Org. II Math. II	English III Acctg. III Mgmt. & Org. III Math. III
2nd Year	Econ. I Psych. I Cap. Inst.— Risk Mgmt. I Inter. Acctg. I	Econ. II Psych. II Cap. Inst.— Risk Mgmt. II Inter. Acctg. II	Econ. III Psych. III Cap. Inst.— Risk Mgmt. III Inter. Acctg. III
3rd Year	E. D. P. I Stat. I Cost Acctg. I Adv. Acctg. I	E. D. P. II Stat. II Cost. Acctg. II Adv. Acctg. II	E. D. P. III Stat. III Cost Acctg. III Adv. Acctg. III
4th Year	Lit. I West. Civ. I Audit. I Fed. Inc. Tax I	Lit. II West. Civ. II Audit. II Fed. Inc. Tax II	Lit. III West. Civ. III Audit. III Fed. Inc. Tax III

ELECTRONIC DATA PROCESSING**Associate in Science Degree**

quarter hours

Basic Courses—required

10.501,	10.502,	10.503	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
30.504,	30.505,	30.506	English I, II, III	6	
30.507,	30.508,	30.509	Introduction to Literature I, II, III	6	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	36
				—	

Core Courses—required

39.511,	39.512,	39.513	Statistics I, II, III	6	
41.501,	41.502,	41.503	Accounting Principles I, II, III	6	
44.501,	44.502,	44.503	Capital Institutions and Risk Management I, II, III	6	
45.501,	45.502,	45.503	Management and Organization I, II, III	6	
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6	30
				—	

Major Concentration Courses—required

10.504,	10.505,	10.506	Mathematics for Business Management I, II, III	6	
		45.573	Basic Computer Programming	2	
	45.574,	45.575	Computer Programming for Business I, II	4	
		45.576	Common Business Oriented Languages	2	
		45.577	Data Systems Administration	2	
	45.578,	45.579	Business Data Processing Applications I, II	4	
45.586,	45.587,	45.588	Systems Design and Techniques I, II, III	6	
		45.630	Introduction to Operations Research	2	
		45.631	Operations Research Applications I	2	30
				—	

Total Credits**96**

Students following a degree program should refer to the suggested course sequence on the opposite page.

ELECTRONIC DATA PROCESSING**Recommended Course Sequence for the 4-Year Program
Leading to the Associate in Science Degree**

	Quarter 1	Quarter 2	Quarter 3
1st Year	English I E. D. P. I Mgmt. & Org. I Math. I	English II E. D. P. II Mgmt. & Org. II Math. II	English III E. D. P. III Mgmt. & Org. III Math. III
2nd Year	Econ. I Acctg. I Math. for Bus. Mgmt. I Basic Comp. Prog.	Econ. II Acctg. II Math. for Bus. Mgmt. II Comp Prog. Bus. I	Econ. III Acctg. III Math. for Bus. Mgmt. III Comp. Prog. Bus. II
3rd Year	Cap. Inst.— Risk Mgmt. I Psych. I Sys. Des.—Tech. I Stat. I	Cap. Inst.— Risk Mgmt. II Psych. II Sys. Des.—Tech. II Stat. II	Cap. Inst.— Risk Mgmt. III Psych. III Sys. Des.—Tech. III Stat. III
4th Year	Lit. I West. Civ. I Bus. Data Proc. Appl. I Data Sys. Adm.	Lit. II West. Civ. II Bus. Data Proc. Appl. II Intro. Op. Res.	Lit. III West. Civ. III COBOL Op. Res. Applications

FINANCE**Bachelor of Science Degree**

quarter hours

Basic Courses—required

10.501,	10.502,	10.503	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
30.504,	30.505,	30.506	English I, II, III	6	
30.507,	30.508,	30.509	Introduction to Literature I, II, III	6	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	36
				—	

Additional Courses—required

16.501,	16.502,	16.503	Natural Science I, II, III	6	
21.501,	21.502,	21.503	Sociology I, II, III	6	
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6	
			Art, Music, or Theatre Arts	6	24
				—	

Core Courses—required

39.511,	39.512,	39.513	Statistics I, II, III	6	
41.501,	41.502,	41.503	Accounting Principles I, II, III	6	
43.501,	43.502,	43.503	Introduction to Marketing I, II, III	6	
44.501,	44.502,	44.503	Capital Institutions and		
			Risk Management I, II, III	6	
44.507,	44.508,	44.509	Corporate Finance I, II, III	6	
45.501,	45.502,	45.503	Management and Organization I, II, III	6	
		45.510	Labor-Management Relations	2	
	45.511,	45.512	Human Relations in Personnel I, II	4	
45.541,	45.542,	45.543	Law I, II, III	6	
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6	54
				—	

Major Concentration Courses—required

	39.517,	39.518	Money and Banking I, II	4	
		39.519	Public Finance	2	
	41.504,	41.505	Accounting—Intermediate I, II	4	
		41.529	Analysis of Financial Statements	2	
	44.511,	44.512	Life Insurance I, II	4	
		44.513	Estate Planning	2	
44.514,	44.515,	44.516	Property and Casualty Insurance I, II, III	6	
44.517,	44.518,	44.519	Investments I, II, III	6	
44.521,	44.522,	44.523	Credit Management I, II, III	6	
	44.531,	44.532	Seminar in Finance I, II	4	
		45.547	Law of Finance	2	
	47.501,	47.502	Real Estate Fundamentals I, II	4	46
				—	

Electives**14****Total Credits****174**

Students following a degree program should refer to the suggested course sequence on the opposite page.

FINANCE

**Recommended Course Sequence for the 8-Year Program
Leading to the Bachelor of Science Degree**

	Quarter 1	Quarter 2	Quarter 3
1st Year	English I Acctg. I Mgmt. & Org. I	English II Acctg. II Mgmt. & Org. II	English III Acctg. III Mgmt. & Org. III
2nd Year	Econ. I Cap. Inst.— Risk Mgmt. I Math. I Inter. Acctg. I	Econ. II Cap. Inst.— Risk Mgmt. II Math. II Inter. Acctg. II	Econ. III Cap. Inst.— Risk Mgmt. III Math. III Anal. Fin. State.
3rd Year	Lit. I Law I Intro. Mktg. I Prop.-Cas. Ins. I	Lit. II Law II Intro. Mktg. II Prop.-Cas. Ins. II	Lit. III Law III Intro. Mktg. III Prop.-Cas. Ins. III
4th Year	Nat. Sci. I Stat. I E. D. P. I Life Ins. I	Nat. Sci. II Stat. II E. D. P. II Life Ins. II	Nat. Sci. III Stat. III E. D. P. III Estate Plan.
5th Year	West. Civ. I Soc. I Corp. Fin. I R. E. Fund. I	West. Civ. II Soc. II Corp. Fin. II R. E. Fund. II	West. Civ. III Soc. III Corp. Fin. III Elective
6th Year	Phil. I Psych. I Lab.-Mgmt. Rel. Credit Mgmt. I	Phil. II Psych. II Human Rel. I Credit Mgmt. II	Phil. III Psych. III Human Rel. II Credit Mgmt. III
7th Year	Art, Music Invest. I Money & Bnkg. I Elective	Art, Music Invest. II Money & Bnkg. II Elective	Art, Music Invest. III Pub. Fin. Elective
8th Year	Law of Fin. Elective	Sem.-Fin. I Elective	Sem.-Fin. II Elective

FINANCE**Associate in Science Degree**

quarter hours

Basic Courses—required

10.501, 10.502, 10.503	Mathematics I, II, III	6	
19.501, 19.502, 19.503	Psychology I, II, III	6	
23.501, 23.502, 23.503	Western Civilization I, II, III	6	
30.504, 30.505, 30.506	English I, II, III	6	
30.507, 30.508, 30.509	Introduction to Literature I, II, III	6	
39.501, 39.502, 39.503	Economic Principles and Problems I, II, III	6	36
		—	

Core Courses—required

39.511, 39.512, 39.513	Statistics I, II, III	6	
41.501, 41.502, 41.503	Accounting Principles I, II, III	6	
44.501, 44.502, 44.503	Capital Institutions and Risk Management I, II, III	6	
45.501, 45.502, 45.503	Management and Organization I, II, III	6	
45.541, 45.542, 45.543	Law I, II, III	6	30
		—	

Major Concentration Courses—required

41.504, 41.505	Accounting—Intermediate I, II	4	
	41.529 Analysis of Financial Statements	2	
44.507, 44.508, 44.509	Corporate Finance I, II, III	6	
44.511, 44.512	Life Insurance I, II	4	
	44.513 Estate Planning	2	
44.517, 44.518, 44.519	Investments I, II, III	6	
44.521, 44.522, 44.523	Credit Management I, II, III	6	30
		—	

Total Credits**96**

Students following a degree program should refer to the suggested course sequence on the opposite page.

FINANCE**Recommended Course Sequence for the 4-Year Program
Leading to the Associate in Science Degree**

	Quarter 1	Quarter 2	Quarter 3
1st Year	English I Acctg. I Mgmt. & Org. I Math. I	English II Acctg. II Mgmt. & Org. II Math. II	English III Acctg. III Mgmt. & Org. III Math. III
2nd Year	Econ. I Psych. I Cap. Inst.— Risk Mgmt. I Inter. Acctg. I	Econ. II Psych. II Cap. Inst.— Risk Mgmt. II Inter. Acctg. II	Econ. III Psych. III Cap. Inst.— Risk Mgmt. III Anal. Fin. State.
3rd Year	Law I Stat. I Corp. Fin. I Life Ins. I	Law II Stat. II Corp. Fin. II Life Ins. II	Law III Stat. III Corp. Fin. III Estate Plan.
4th Year	Lit. I West. Civ. I Invest. I Credit Mgmt. I	Lit. II West. Civ. II Invest. II Credit Mgmt. II	Lit. III West. Civ. III Invest. III Credit Mgmt. III

INDUSTRIAL MANAGEMENT**Bachelor of Science Degree**

quarter hours

Basic Courses—required

10.501,	10.502,	10.503	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
30.504,	30.505,	30.506	English I, II, III	6	
30.507,	30.508,	30.509	Introduction to Literature I, II, III	6	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	36

Additional Courses—required

16.501,	16.502,	16.503	Natural Science I, II, III	6	
21.501,	21.502,	21.503	Sociology I, II, III	6	
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6	
			Art, Music, or Theatre Arts	6	24

Core Courses—required

39.511,	39.512,	39.513	Statistics I, II, III	6	
41.501,	41.502,	41.503	Accounting Principles I, II, III	6	
43.501,	43.502,	43.503	Introduction to Marketing I, II, III	6	
		45.510	Labor-Management Relations	2	
	45.511,	45.512	Human Relations in Personnel I, II	4	
44.501,	44.502,	44.503	Capital Institutions and Risk Management I, II, III	6	
44.507,	44.508,	44.509	Corporate Finance I, II, III	6	
45.501,	45.502,	45.503	Management and Organization I, II, III	6	
45.541,	45.542,	45.543	Law I, II, III	6	
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6	54

Major Concentration Courses—required

		45.505	Production and Inventory Control	2	
45.519,	45.520,	45.521	Work I, II, III	6	
		45.526	Plant Layout	2	
	45.531,	45.532	Material Handling I, II	4	
		45.536	Principles of Material Inspection	2	
	45.537,	45.538	Purchasing I, II	4	
	45.561,	45.562	Statistical Quality Control I, II	4	
	45.586,	45.587	Systems Design and Techniques I, II	4	
45.595,	45.596,	45.597	Manufacturing Seminar I, II, III	6	
45.623,	45.624,	45.625	Manufacturing I, II, III	6	
	45.627,	45.628	Value Analysis and Planning I, II	4	
		45.630	Introduction to Operations Research	2	46

Electives**14****Total Credits****174**

Students following a degree program should refer to the suggested course sequence on the opposite page.

INDUSTRIAL MANAGEMENT**Recommended Course Sequence for the 8-Year Program
Leading to the Bachelor of Science Degree**

	Quarter 1	Quarter 2	Quarter 3
1st Year	English I Acctg. I Mgmt. & Org. I	English II Acctg. II Mgmt. & Org. II	English III Acctg. III Mgmt. & Org. III
2nd Year	Econ. I Cap. Inst.— Risk Mgmt. I E.D.P. I Mfg. I	Econ. II Cap. Inst.— Risk Mgmt. II E.D.P. II Mfg. II	Econ. III Cap. Inst.— Risk Mgmt. III E.D.P. III Mfg. III
3rd Year	Law I Math. I Intro. Mktg. I Work I	Law II Math. II Intro. Mktg. II Work II	Law III Math. III Intro. Mktg. III Work III
4th Year	Psych. I Stat. I Basic Comp. Prog. Value A. & P. I	Psych. II Stat. II Sys. Des.—Tech. I Value A. & P. II	Psych. III Stat. III Sys. Des.—Tech. II Elective
5th Year	West. Civ. I Lit. I Corp. Fin. I Nat'l Inspect.	West. Civ. II Lit. II Corp. Fin. II Stat. Qual. Cont. I	West. Civ. III Lit. III Corp. Fin. III Stat. Qual. Cont. II
6th Year	Nat. Sci. I Phil. I Oper. Res. Art, Music	Nat. Sci. II Phil. II Purch. I Art, Music	Nat. Sci. III Phil. III Purch. II Art, Music
7th Year	Soc. I Lab.-Mgmt. Rel. Mat'l Hand. I	Soc. II Human Rel. I Mat'l. Hand. II	Soc. III Human Rel. II Plant Layout
8th Year	Mfg. Sem. I Prod. & Inv. Cont. Elective	Mfg. Sem. II Elective Elective	Mfg. Sem. III Elective Elective

INDUSTRIAL MANAGEMENT**Associate in Science Degree**

quarter hours

Basic Courses—required

10.501,	10.502,	10.503	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
30.504,	30.505,	30.506	English I, II, III	6	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	24
				—	

Core Courses—required

39.511,	39.512,	39.513	Statistics I, II, III	6	
41.501,	41.502,	41.503	Accounting Principles I, II, III	6	
43.501,	43.502,	43.503	Introduction to Marketing I, II, III	6	
44.501,	44.502,	44.503	Capital Institutions and Risk Management I, II, III	6	
45.501,	45.502,	45.503	Management and Organization I, II, III	6	
45.541,	45.542,	45.543	Law I, II, III	6	
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6	42
				—	

Major Concentration Courses—required

		45.505	Production and Inventory Control	2	
45.519,	45.520,	45.615	Work Simplification, Measurement and Sampling	6	
45.623,	45.624,	45.625	Manufacturing I, II, III	6	
	45.586,	45.587	Systems Design and Techniques I, II	4	
	45.627,	45.628	Value Analysis and Planning I, II	4	22
				—	

Electives**8****Total Credits****96**

Students following a degree program should refer to the suggested course sequence on the opposite page.

INDUSTRIAL MANAGEMENT

**Recommended Course Sequence for the 4-Year Program
Leading to the Associate in Science Degree**

	Quarter 1	Quarter 2	Quarter 3
1st Year	English I Acctg. I Mgmt. & Org. I	English II Acctg. II Mgmt. & Org. II	English III Acctg. III Mgmt. & Org. III
2nd Year	Econ. I Cap. Inst.— Risk Mgmt. I E. D. P. I Mfg. I	Econ. II Cap. Inst.— Risk Mgmt. II E. D. P. II Mfg. II	Econ. III Cap. Inst.— Risk Mgmt. III E. D. P. III Mfg. III
3rd Year	Law I Math. I Intro. Mktg. I Work Simp. I	Law II Math. II Intro. Mktg. II Work Meas. I	Law III Math. III Intro. Mktg. III Work Sampling I
4th Year	Psych. I Stat. I Basic Comp. Prog. Value A. & P. I	Psych. II Stat. II Sys. Des.—Tech. I Value A. & P. II	Psych. III Stat. III Sys. Des.—Tech. II Elective



INDUSTRIAL TECHNOLOGY**Bachelor of Science Degree**

Industrial Technology is concerned with the application of scientific methods to problems in the field of production management involving the effective use of men, materials, machinery, and money.

The Industrial Technology curriculum combines fundamental courses in one of several areas of engineering technology with an integrated program in management, the humanities, and the social sciences to provide background for those who aspire to positions of managerial responsibility where technical knowledge is required.

Upon graduation, the industrial technologist may find his way into such factory staff departments as methods engineering, production planning and control, wage administration, quality control, and time study. Additional opportunities are in cost accounting, statistical analysis, sales engineering, and safety engineering.

The curriculum is offered by University College in conjunction with Lincoln College. Graduates of Lincoln College or other technical schools who have been awarded the Associate degree may be granted up to 96 hours' credit toward the Bachelor of Science degree. The technology requirements may also be earned by satisfactory completion of equivalent technology courses in an accredited engineering college or technical institute.

The total requirements for the degree are 174 quarter hours, distributed as follows:

				quarter hours	
Engineering or Science Technology Courses					96
Liberal Content—required					
19.501,	19.502,	19.503	Psychology I, II, III	6	
21.501,	21.502,	21.503	Sociology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
30.504,	30.505,	30.506	English I, II, III	6	
30.507,	30.508,	30.509	Introduction to Literature I, II, III	6	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	36
				—	
Management Courses—required					
		39.510	Statistics for Quality Control	2	
41.501,	41.502,	41.503	Accounting Principles I, II, III	6	
	43.501,	43.502	Introduction to Marketing I, II	4	
45.501,	45.502,	45.503	Management and Organization I, II, III	6	
		45.510	Labor-Management Relations	2	
45.541,	45.542,	45.543	Law I, II, III	6	
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6	
		45.624	Manufacturing II	2	34
				—	
Electives					8
					<hr/>
Total Credits					174

INSURANCE**Bachelor of Science Degree**

quarter hours

Basic Courses—required

10.501,	10.502,	10.503	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
30.504,	30.505,	30.506	English I, II, III	6	
30.507,	30.508,	30.509	Introduction to Literature I, II, III	6	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	36
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Additional Courses—required

16.501,	16.502,	16.503	Natural Science I, II, III	6	
21.501,	21.502,	21.503	Sociology I, II, III	6	
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6	
			Art, Music, or Theatre Arts	6	24
				—	

Core Courses—required

39.511,	39.512,	39.513	Statistics I, II, III	6	
41.501,	41.502,	41.503	Accounting Principles I, II, III	6	
43.501,	43.502,	43.503	Introduction to Marketing I, II, III	6	
44.501,	44.502,	44.503	Capital Institutions and		
			Risk Management I, II, III	6	
44.507,	44.508,	44.509	Corporate Finance I, II, III	6	
45.501,	45.502,	45.503	Management and Organization I, II, III	6	
		45.510	Labor-Management Relations	2	
		45.511,	Human Relations in Personnel I, II	4	
		45.512			
45.541,	45.542,	45.543	Law I, II, III	6	
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6	54
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Major Concentration Courses—required

	39.517,	39.518	Money and Banking I, II	4	
		39.519	Public Finance	2	
	44.511,	44.512	Life Insurance I, II	4	
		44.513	Estate Planning	2	
44.514,	44.515,	44.516	Property and Casualty Insurance I, II, III	6	
		44.520	Life Insurance Problems	2	
44.521,	44.522,	44.523	Credit Management I, II, III	6	
		44.524	Property and Casualty Insurance Problems	2	
	44.525,	44.526	Health and Social Insurance I, II	4	
		44.527	Business and Group Insurance and		
			Pensions	2	
		44.528	Insurance for Management	2	
		45.550	Law of Insurance	2	
	47.501,	47.502	Real Estate Fundamentals I, II	4	42
				—	

Electives

18

Total Credits

174

Students following a degree program should refer to the suggested course sequence on the opposite page.

INSURANCE

**Recommended Course Sequence for the 8-Year Program
Leading to the Bachelor of Science Degree**

	Quarter 1	Quarter 2	Quarter 3
1st Year	English I Acctg. I Mgmt. & Org. I	English II Acctg. II Mgmt. & Org. II	English III Acctg. III Mgmt. & Org. III
2nd Year	Econ. I E. D. P. I Math. I Cap. Inst.— Risk Mgmt. I	Econ. II E. D. P. II Math. II Cap. Inst.— Risk Mgmt. II	Econ. III E. D. P. III Math. III Cap. Inst.— Risk Mgmt. III
3rd Year	Lit. I Law I Intro. Mktg. I Life Ins. I	Lit. II Law II Intro. Mktg. II Life Ins. II	Lit. III Law III Intro. Mktg. III Estate Plng.
4th Year	Nat. Sci. I Stat. I Prop.-Cas. Ins. I R. E. Fund. I	Nat. Sci. II Stat. II Prop.-Cas. Ins. II R. E. Fund. II	Nat. Sci. III Stat. III Prop.-Cas. Ins. III Elective
5th Year	West. Civ. I Soc. I Corp. Fin. I Hlth.-Soc. Ins. I	West. Civ. II Soc. II Corp. Fin. II Hlth.Soc. Ins. II	West. Civ. III Soc. III Corp. Fin. III Elective
6th Year	Phil. I Psych. I Lab.-Mgmt. Rel. Credit Mgmt. I	Phil. II Psych. II Human Rel. I Credit Mgmt. II	Phil. III Psych. III Human Rel. II Credit Mgmt. III
7th Year	Art, Music Money & Bnkg. I Bus.-Grp. Ins. Pen.	Art, Music Money & Bnkg. II Ins. for Mgt.	Art, Music Pub. Fin. Elective
8th Year	Insurance Law Elective Elective	Prop.-Cas. Ins. Prob. Elective Elective	Life Ins. Prob. Elective Elective

INSURANCE

Associate in Science Degree

quarter hours

Basic Courses—required

10.501,	10.502,	10.503	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
30.504,	30.505,	30.506	English I, II, III	6	
30.507,	30.508,	30.509	Introduction to Literature I, II, III	6	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	36
				—	

Core Courses—required

39.511,	39.512,	39.513	Statistics I, II, III	6	
41.501,	41.502,	41.503	Accounting Principles I, II, III	6	
44.501,	44.502,	44.503	Capital Institutions and Risk Management I, II, III	6	
45.501,	45.502,	45.503	Management and Organization I, II, III	6	
45.541,	45.542,	45.543	Law I, II, III	6	30
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Major Concentration Courses—required

44.507,	44.508,	44.509	Corporate Finance I, II, III	6	
	44.511,	44.512	Life Insurance I, II	4	
		44.513	Estate Planning	2	
44.514,	44.515,	44.516	Property and Casualty Insurance I, II, III	6	
		44.520	Life Insurance Problems	}	
			or		
		44.524	Property and Casualty Insurance Problems		2
	44.525,	44.526	Health and Social Insurance I, II	4	
		44.527	Business and Group Insurance and Pensions	2	
		44.528	Insurance for Management	2	
		45.550	Law of Insurance	2	30
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Total Credits **96**

Students following a degree program should refer to the suggested course sequence on the opposite page.

INSURANCE

**Recommended Course Sequence for the 4-Year Program
Leading to the Associate in Science Degree**

	Quarter 1	Quarter 2	Quarter 3
1st Year	English I Acctg. I Mgmt. & Org. I Math. I	English II Acctg. II Mgmt. & Org. II Math. II	English III Acctg. III Mgmt. & Org. III Math. III
2nd Year	Econ. I Psych. I Cap. Inst.— Risk Mgmt. I Prop.-Cas. Ins. I	Econ. II Psych. II Cap. Inst.— Risk Mgmt. II Prop.-Cas. Ins. II	Econ. III Psych. III Cap. Inst.— Risk Mgmt. III Prop.-Cas. Ins. III
3rd Year	Law I Stat. I Life Ins. I Corp. Fin. I	Law II Stat. II Life Ins. II Corp. Fin. II	Law III Stat. III Estate Plan. Corp. Fin. III
4th Year	Lit. I West. Civ. I Hlth.-Soc. Ins. I Ins. Law	Lit. II West. Civ. II Hlth.-Soc. Ins. II Bus.-Grp. Ins.-Pen.	Lit. III West. Civ. III Elective Problems Course* Ins. for Mgmt.

*Depending on the student's area of concentration, either the Life Insurance Problems (44.520) or Property and Casualty Insurance Problems (44.524) may be elected at this point.

MANAGEMENT**Bachelor of Science Degree**

quarter hours

Basic Courses—required

10.501,	10.502,	10.503	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
30.504,	30.505,	30.506	English I, II, III	6	
30.507,	30.508,	30.509	Introduction to Literature I, II, III	6	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	36
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Additional Courses—required

16.501,	16.502,	16.503	Natural Science I, II, III	6	
21.501,	21.502,	21.503	Sociology I, II, III	6	
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6	
			Art, Music, or Theatre Arts	6	24
				—	

Core Courses—required

39.511,	39.512,	39.513	Statistics I, II, III	6	
41.501,	41.502,	41.503	Accounting Principles I, II, III	6	
43.501,	43.502,	43.503	Introduction to Marketing I, II, III	6	
44.501,	44.502,	44.503	Capital Institutions and Risk Management I, II, III	6	
44.507,	44.508,	44.509	Corporate Finance I, II, III	6	
45.501,	45.502,	45.503	Management and Organization I, II, III	6	
		45.510	Labor-Management Relations	2	
		45.511,	45.512	Human Relations in Personnel I, II	4
45.541,	45.542,	45.543	Law I, II, III	6	
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6	54
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Major Concentration Courses—required

29.501,	29.502,	29.503	Effective Speaking I, II, III	6	
30.511,	30.512,	30.513	Business Writing and Reports I, II, III	6	
	39.531,	39.532	Business Cycles I, II	4	
		39.533	Business Planning and Research	2	
41.533,	41.534,	41.535	Accounting for Management Decisions I, II, III	6	
43.507,	43.508,	43.509	Sales Force Management I, II, III	6	
45.506,	45.507,	45.508	Industrial Management I, II, III	6	
45.523,	45.524,	45.525	Management Seminar I, II, III	6	42
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Electives**18****Total Credits****174**

Students following a degree program should refer to the suggested course sequence on the opposite page.

MANAGEMENT**Recommended Course Sequence for the 8-Year Program
Leading to the Bachelor of Science Degree**

	Quarter 1	Quarter 2	Quarter 3
1st Year	English I Acctg. I Mgmt. & Org. I	English II Acctg. II Mgmt. & Org. II	English III Acctg. III Mgmt. & Org. III
2nd Year	Econ. I E. D. P. I Math. I Ind. Mgmt. I	Econ. II E. D. P. II Math. II Ind. Mgmt. II	Econ. III E. D. P. III Math. III Ind. Mgmt. III
3rd Year	Lit. I Law I Intro. Mktg. I Acctg. Mgmt. Dec. I	Lit. II Law II Intro. Mktg. II Acctg. Mgmt. Dec. II	Lit. III Law III Intro. Mktg. III Acctg. Mgmt. Dec. III
4th Year	Nat. Sci. I Stat. I Cap. Inst.— Risk Mgmt. I Eff. Spkg. I	Nat. Sci. II Stat. II Cap. Inst.— Risk Mgmt. II Eff. Spkg. II	Nat. Sci. III Stat. III Cap. Inst.— Risk Mgmt. III Eff. Spkg. III
5th Year	West. Civ. I Soc. I Corp. Fin. I Lab.-Mgmt. Rel.	West. Civ. II Soc. II Corp. Fin. II Human Rel. I	West. Civ. III Soc. III Corp. Fin. III Human Rel. II
6th Year	Phil. I Psych. I Sales Force Mgmt. I Bus. Writ. & Rep. I	Phil. II Psych. II Sales Force Mgmt. II Bus. Writ. & Rep. II	Phil. III Psych. III Sales Force Mgmt. III Bus. Writ. & Rep. III
7th Year	Art, Music Bus. Cycles I Elective	Art, Music Bus. Cycles II Elective	Art, Music Bus. Plan. & Res. Elective
8th Year	Mgmt. Sem. I Elective Elective	Mgmt. Sem. II Elective Elective	Mgmt. Sem. III Elective Elective

MANAGEMENT**Associate in Science Degree**

quarter hours

Basic Courses—required

10.501,	10.502,	10.503	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
30.504,	30.505,	30.506	English I, II, III	6	
30.507,	30.508,	30.509	Introduction to Literature I, II, III	6	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	36

Core Courses—required

39.511,	39.512,	39.513	Statistics I, II, III	6	
41.501,	41.502,	41.503	Accounting Principles I, II, III	6	
44.501,	44.502,	44.503	Capital Institutions and Risk Management I, II, III	6	
45.501,	45.502,	45.503	Management and Organization I, II, III	6	
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6	30

Major Concentration Courses—required

41.533,	41.534,	41.535	Accounting for Management Decisions I, II, III	6	
44.507,	44.508,	44.509	Corporate Finance I, II, III	6	
45.506,	45.507,	45.508	Industrial Management I, II, III	6	
		45.510	Labor-Management Relations	2	
	45.511,	45.512	Human Relations in Personnel I, II	4	
45.541,	45.542,	45.543	Law I, II, III	6	30
Total Credits				—	96

Students following a degree program should refer to the suggested course sequence on the opposite page.

MANAGEMENT**Recommended Course Sequence for the 4-Year Program
Leading to the Associate in Science Degree**

	Quarter 1	Quarter 2	Quarter 3
1st Year	English I Acctg. I Mgmt. & Org. I Math. I	English II Acctg. II Mgmt. & Org. II Math. II	English III Acctg. III Mgmt. & Org. III Math. III
2nd Year	Econ. I Psych. I Cap. Inst.— Risk Mgmt. I Acctg. Mgmt. Dec. I	Econ. II Psych. II Cap. Inst.— Risk Mgmt. II Acctg. Mgmt. Dec. II	Econ. III Psych. III Cap. Inst.— Risk Mgmt. III Acctg. Mgmt. Dec. III
3rd Year	E. D. P. I Stat. I Corp. Fin. I Ind. Mgmt. I	E. D. P. II Stat. II Corp. Fin. II Ind. Mgmt. II	E. D. P. III Stat. III Corp. Fin. III Ind. Mgmt. III
4th Year	Lit. I West. Civ. I Lab.-Mgmt. Rel. Law I	Lit. II West. Civ. II Human Rel. I Law II	Lit. III West. Civ. III Human Rel. II Law III

MANAGEMENT INFORMATION SYSTEMS**Bachelor of Science Degree**

quarter hours

Basic Courses—required

10.501,	10.502,	10.503	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
30.504,	30.505,	30.506	English I, II, III	6	
30.507,	30.508,	30.509	Introduction to Literature I, II, III	6	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	36
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Additional Courses—required

16.501,	16.502,	16.503	Natural Science I, II, III	6	
21.501,	21.502,	21.503	Sociology I, II, III	6	
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6	
			Art, Music, or Theatre Arts	6	24
				—	

Core Courses—required

39.511,	39.512,	39.513	Statistics I, II, III	6	
41.501,	41.502,	41.503	Accounting Principles I, II, III	6	
43.501,	43.502,	43.503	Introduction to Marketing I, II, III	6	
44.501,	44.502,	44.503	Capital Institutions and Risk Management I, II, III	6	
44.507,	44.508,	44.509	Corporate Finance I, II, III	6	
45.501,	45.502,	45.503	Management and Organization I, II, III	6	
		45.510	Labor-Management Relations	2	
	45.511,	45.512	Human Relations in Personnel I, II	4	
45.541,	45.542,	45.543	Law I, II, III	6	
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6	54
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Major Concentration Courses—required

10.504,	10.505,	10.506	Mathematics for Business Management I, II, III	6	
		26.534	Logic I	2	
		45.573	Basic Computer Programming	2	
	45.574,	45.575	Computer Programming for Business I, II	4	
		45.576	COmmon BUssiness ORiented Languages	2	
		45.577	DAta SYstems ADministration	2	
	45.578,	45.579	Business Data Processing Applications I, II	4	
45.586,	45.587,	45.588	Systems Design and Techniques I, II, III	6	
45.589,	45.590,	45.591	Advanced Systems Design I, II, III	6	
45.592,	45.593,	45.594	Advanced Systems Techniques I, II, III	6	
		45.630	Introduction to Operations Research	2	
	45.631,	45.632	Operations Research Applications I, II	4	46
				—	

Electives

14

Total Credits

174

Students following a degree program should refer to the suggested course sequence on the opposite page.

MANAGEMENT INFORMATION SYSTEMS**Recommended Course Sequence for the 8-Year Program
Leading to the Bachelor of Science Degree**

	Quarter 1	Quarter 2	Quarter 3
1st Year	English I Acctg. I Mgmt. & Org. I	English II Acctg. II Mgmt. & Org. II	English III Acctg. III Mgmt. & Org. III
2nd Year	Econ. I E. D. P. I Math. I Sys. Des.-Tech. I	Econ. II E. D. P. II Math. II Sys. Des.-Tech. II	Econ. III E. D. P. III Math. III Sys. Des.-Tech. III
3rd Year	Lit. I Law I Intro. Mktg. I Logic I	Lit. II Law II Intro. Mktg. II Elective	Lit. III Law III Intro. Mktg. III Elective
4th Year	Nat. Sci. I Stat. I Cap. Inst.— Risk Mgmt. I Math. Bus. Mgmt. I	Nat. Sci. II Stat. II Cap. Inst.— Risk Mgmt. II Math. Bus. Mgmt. II	Nat. Sci. III Stat. III Cap. Inst.— Risk Mgmt. III Math. Bus. Mgmt. III
5th Year	West. Civ. I Soc. I Corp. Fin. I Basic Comp. Prog.	West. Civ. II Soc. II Corp. Fin. II Comp. Prog.-Bus. I	West. Civ. III Soc. III Corp. Fin. III Comp. Prog.-Bus. II
6th Year	Phil. I Psych. I Lab.-Mgmt. Rel. Adv. Sys. Des. I	Phil. II Psych. II Human Rel. I Adv. Sys. Des. II	Phil. III Psych. III Human Rel. II Adv. Sys. Des. III
7th Year	Intro. Oper. Res. Adv. Sys. Tech. I Elective	O. R. Appl. I Adv. Sys. Tech. II Elective	O. R. Appl. II Adv. Sys. Tech. III Elective
8th Year	Art, Music COBOL Data Sys. Admin.	Art, Music D. P. Appl. I Elective	Art, Music D. P. Appl. II Elective

MARKETING**Bachelor of Science Degree**

quarter hours

Basic Courses—required

10.501,	10.502,	10.503	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
30.504,	30.505,	30.506	English I, II, III	6	
30.507,	30.508,	30.509	Introduction to Literature I, II, III	6	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	36
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Additional Courses—required

16.501,	16.502,	16.503	Natural Science I, II, III	6	
21.501,	21.502,	21.503	Sociology I, II, III	6	
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6	
				Art, Music, or Theatre Arts	6
					24
					—

Core Courses—required

39.511,	39.512,	39.513	Statistics I, II, III	6	
41.501,	41.502,	41.503	Accounting Principles I, II, III	6	
43.501,	43.502,	43.503	Introduction to Marketing I, II, III	6	
44.501,	44.502,	44.503	Capital Institutions and Risk Management I, II, III	6	
44.507,	44.508,	44.509	Corporate Finance I, II, III	6	
45.501,	45.502,	45.503	Management and Organization I, II, III	6	
				Labor-Management Relations	2
				45.511, 45.512 Human Relations in Personnel I, II	4
45.541,	45.542,	45.543	Law I, II, III	6	
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6	54
					—

Major Concentration Courses—required

			41.536	Distribution Cost Analysis	2	
43.507,	43.508,	43.509		Sales Management I, II, III	6	
43.511,	43.512,	43.513		Creative Marketing		
				Communications I, II, III	6	
			43.518,	43.519	Retailing I, II	4
				43.520	Industrial Marketing	2
			43.525,	43.526	Market Research I, II	4
				43.529	Introduction to International Marketing	2
43.532,	43.533,	43.534		Marketing Management I, II, III	6	
				43.541	Public Relations I	2
			44.521	Credit Management I	2	36
					—	

Electives**24****Total Credits****174**

Students following a degree program should refer to the suggested course sequence on the opposite page.

MARKETING**Recommended Course Sequence for the 8-Year Program
Leading to the Bachelor of Science Degree**

	Quarter 1	Quarter 2	Quarter 3
1st Year	English I Acctg. I Mgmt. & Org. I	English II Acctg. II Mgmt. & Org. II	English III Acctg. III Mgmt. & Org. III
2nd Year	Econ. I Cap. Inst.— Risk Mgmt. I Math. I Intro. Mktg. I	Econ. II Cap. Inst.— Risk Mgmt. II Math. II Intro. Mktg. II	Econ. III Cap. Inst.— Risk Mgmt. III Math. III Intro. Mktg. III
3rd Year	Lit. I Law I Sales Mgmt. I Elective	Lit. II Law II Sales Mgmt. II Elective	Lit. III Law III Sales Mgmt. III Elective
4th Year	Nat. Sci. I Stat. I E. D. P. I Creat. Mktg. Comm. I	Nat. Sci. II Stat. II E. D. P. II Creat. Mktg. Comm. II	Nat. Sci. III Stat. III E. D. P. III Creat. Mktg. Comm. III
5th Year	West. Civ. I Soc. I Corp. Fin. I Retail. I	West. Civ. II Soc. II Corp. Fin. II Retail. II	West. Civ. III Soc. III Corp. Fin. III Ind. Mktg.
6th Year	Phil. I Psych. I Lab.-Mgmt. Rel. Mkt. Res. I	Phil. II Psych. II Human Rel. I Mkt. Res. II	Phil. III Psych. III Human Rel. II Intro. Int'l Mktg.
7th Year	Art, Music Mktg. Mgmt. I Cred. Mgmt. I	Art, Music Mktg. Mgmt. II Pub. Rel. I	Art, Music Dist. Cost Anal. Mktg. Mgmt. III
8th Year	Elective Elective Elective	Elective Elective Elective	Elective Elective Elective

MARKETING**Associate in Science Degree****Basic Courses—required**

quarter hours

10.501,	10.502,	10.503	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
30.504,	30.505,	30.506	English I, II, III	6	
30.507,	30.508,	30.509	Introduction to Literature I, II, III	6	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	36

Core Courses—required

39.511,	39.512,	39.513	Statistics I, II, III	6	
41.501,	41.502,	41.503	Accounting Principles I, II, III	6	
43.501,	43.502,	43.503	Introduction to Marketing I, II, III	6	
45.501,	45.502,	45.503	Management and Organization I, II, III	6	
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6	30

Major Concentration Courses—required

		41.536	Distribution Cost Analysis	2	
43.507,	43.508,	43.509	Sales Force Management I, II, III	6	
43.511,	43.512,	43.513	Creative Marketing		
			Communications I, II, III	6	
	43.518,	43.519	Retailing I, II	4	
		43.520	Industrial Marketing	2	
	43.525,	43.526	Market Research I, II	4	
		43.529	Introduction to International Marketing	2	
	43.532,	43.533	Marketing Management I, II	4	30
				—	96
			Total Credits		

Students following a degree program should refer to the suggested course sequence on the opposite page.

MARKETING**Recommended Course Sequence for the 4-Year Program
Leading to the Associate in Science Degree**

	Quarter 1	Quarter 2	Quarter 3
1st Year	English I Acctg. I Mgmt. & Org. I Intro. Mktg. I	English II Acctg. II Mgmt. & Org. II Intro. Mktg. II	English III Acctg. III Mgmt. & Org. III Intro. Mktg. III
2nd Year	Econ. I Psych. I Math. I Sales Force Mgmt. I	Econ. II Psych. II Math. II Sales Force Mgmt. II	Econ. III Psych. III Math. III Sales Force Mgmt. III
3rd Year	E. D. P. I Stat. I Retail. I Mkt. Res. I	E. D. P. II Stat. II Retail. II Mkt. Res. II	E. D. P. III Stat. III Dist. Cost. Anal. Intro. Int'l Mktg.
4th Year	Lit. I West. Civ. I Mktg. Mgmt. I Creat. Mktg. Comm. I	Lit. II West. Civ. II Mktg. Mgmt. II Creat. Mktg. Comm. II	Lit. III West. Civ. III Mktg. Mgmt. III Creat. Mktg. Comm. III

PERSONNEL AND INDUSTRIAL RELATIONS Bachelor of Science Degree

Basic Courses—required				quarter hours	
10.501,	10.502,	10.503	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
30.504,	30.505,	30.506	English I, II, III	6	
30.507,	30.508,	30.509	Introduction to Literature I, II, III	6	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	36
				—	
Core Courses—required					
16.501,	16.502,	16.503	Natural Science I, II, III	6	
21.501,	21.502,	21.503	Sociology I, II, III	6	
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6	
			Art, Music, or Theatre Arts	6	24
				—	
Core Courses—required					
39.511,	39.512,	39.513	Statistics I, II, III	6	
41.501,	41.502,	41.503	Accounting Principles I, II, III	6	
43.501,	43.502,	43.503	Introduction to Marketing I, II, III	6	
44.501,	44.502,	44.503	Capital Institutions and		
			Risk Management I, II, III	6	
44.507,	44.508,	44.509	Corporate Finance I, II, III	6	
45.501,	45.502,	45.503	Management and Organization I, II, III	6	
		45.510	Labor-Management Relations	2	
		45.511,	45.512	Human Relations in Personnel I, II	4
45.541,	45.542,	45.543	Law I, II, III	6	
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6	54
				—	
Major Concentration Courses—required					
45.513,	45.514,	45.515	Personnel Management I, II, III	6	
		45.517	Techniques of Employee Selection	2	
		45.518	Wage and Salary Administration	2	
		45.521	Employee Benefits and Social Security	2	
		45.522	Job Evaluation	2	
		45.545	Law of Employment Standards	2	
		45.546	Law of Employment Conditions	2	
		45.548	Law of Labor Management Relations	2	
		45.553	The Labor Agreement	2	
		45.555	Recent Labor and Social Law	2	
		45.556	Negotiation, Mediation, Arbitration	2	
		45.560	Seminar on Labor Issues	2	28
				—	
Electives					32
					<hr/>
Total Credits					174

Students following a degree program should refer to the suggested course sequence on the opposite page.

PERSONNEL AND INDUSTRIAL RELATIONS**Recommended Course Sequence for the 8-Year Program
Leading to the Bachelor of Science Degree**

	Quarter 1	Quarter 2	Quarter 3
1st Year	English I Acctg. I Mgmt. & Org. I	English II Acctg. II Mgmt. & Org. II	English III Acctg. III Mgmt. & Org. III
2nd Year	Econ. I Cap. Inst.— Risk Mgmt. I Law I Elective	Econ. II Cap. Inst.— Risk Mgmt. II Law II Elective	Econ. III Cap. Inst.— Risk Mgmt. III Law III Elective
3rd Year	Lit. I Math. I Intro. Mktg. I Psych. I	Lit. II Math. II Intro. Mktg. II Psych. II	Lit. III Math. III Intro. Mktg. III Psych. III
4th Year	Nat. Sci. I Stat. I E. D. P. I Pers. Mgmt. I	Nat. Sci. II Stat. II E. D. P. II Pers. Mgmt. II	Nat. Sci. III Stat. III E. D. P. III Pers. Mgmt. III
5th Year	West. Civ. I Soc. I Corp. Fin. I Human Rel. I	West. Civ. II Soc. II Corp. Fin. II Human Rel. II	West. Civ. III Soc. III Corp. Fin. III Lab.-Mgmt. Rel.
6th Year	Phil. I Wage Sal. Adm. Elective Law Emp. Stand.	Phil. II Job Eval. Law Lab.-Mat. Rel. Law Emp. Cond.	Phil. III Empl. Ben. Tech. Emp. Sel. Rec. Lab.-Soc. Law
7th Year	Art, Music Elective Elective	Art, Music Elective Elective	Art, Music Elective Elective
8th Year	Labor Agree. Elective Elective	Neg., Med. & Arb. Elective Elective	Sem.—Lab. Issues Elective Elective

PERSONNEL AND INDUSTRIAL RELATIONS Associate in Science Degree

Basic Courses—required				quarter hours	
10.501,	10.502,	10.503	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
30.504,	30.505,	30.506	English I, II, III	6	
30.507,	30.508,	30.509	Introduction to Literature I, II, III	6	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	36
				—	
Core Courses—required					
39.511,	39.512,	39.513	Statistics I, II, III	6	
41.501,	41.502,	41.503	Accounting Principles I, II, III	6	
44.501,	44.502,	44.503	Capital Institutions and Risk Management I, II, III	6	
45.501,	45.502,	45.503	Management and Organization I, II, III	6	
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6	30
				—	
Major Concentration Courses—required					
		19.532	Introduction to Industrial Psychology	2	
		39.527	Labor Economics	2	
		45.510	Labor Management Relations	2	
	45.511,	45.512	Human Relations in Personnel I, II	4	
45.513,	45.514,	45.515	Personnel Management I, II, III	6	
		45.518	Wage Salary Administration	2	
		45.521	Employee Benefits	2	
		45.545	Law of Employment Standards	2	
		45.546	Law of Employment Conditions	2	
		45.548	Law of Labor Management Relations	2	
		45.553	Labor Agreement	2	
		45.556	Negotiation, Mediation, and Arbitration	2	30
				—	
Total Credits					96

Students following a degree program should refer to the suggested course sequence on the opposite page.

PERSONNEL AND INDUSTRIAL RELATIONS**Recommended Course Sequence for the 4-Year Program
Leading to the Associate in Science Degree**

	Quarter 1	Quarter 2	Quarter 3
1st Year	English I Acctg. I Mgmt. & Org. I Math. I	English II Acctg. II Mgmt. & Org. II Math. II	English III Acctg. III Mgmt. & Org. III Math. III
2nd Year	Econ. I Psych. I Cap. Inst.— Risk Mgmt. I Ind. Psych.	Econ. II Psych. II Cap. Inst.— Risk Mgmt. II Human Rel. I	Econ. III Psych. III Cap. Inst.— Risk Mgmt. III Human Rel. II
3rd Year	E. D. P. I Stat. I Pers. Mgmt. I Lab.-Mgmt. Rel.	E. D. P. II Stat. II Pers. Mgmt. II Wage-Sal. Admin.	E. D. P. III Stat. III Pers. Mgmt. III Lab. Econ.
4th Year	Lit. I West. Civ. I Empl. Ben. Law Empl. Stand.	Lit. II West. Civ. II Lab. Agree. Law Empl. Cond.	Lit. III West. Civ. III Neg., Med.—Arbit. Law Lab.-Mgmt. Rel.

PURCHASING**Associate in Science Degree****Basic Courses—required**

quarter hours

10.501, 10.502, 10.503	Mathematics I, II, III	6	
19.501, 19.502, 19.503	Psychology I, II, III	6	
23.501, 23.502, 23.503	Western Civilization I, II, III	6	
30.504, 30.505, 30.506	English I, II, III	6	
30.507, 30.508, 30.509	Introduction to Literature I, II, III	6	
39.501, 39.502, 39.503	Economic Principles and Problems I, II, III	6	36
		—	

Core Courses—required

39.511, 39.512, 39.513	Statistics I, II, III	6	
41.501, 41.502, 41.503	Accounting Principles I, II, III	6	
44.507, 44.508, 44.509	Corporate Finance I, II, III	6	
45.501, 45.502, 45.503	Management and Organization I, II, III	6	
45.570, 45.571, 45.572	Electronic Data Processing I, II, III	6	30
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Major Concentration Courses—required

		43.520	Industrial Marketing	2	
		45.510	Labor Management Relations	2	
	45.511,	45.512	Human Relations in Personnel I, II	4	
		45.536	Principles of Material Inspection	2	
45.537,	45.538,	45.539	Purchasing I, II, III	6	
45.541,	45.542,	45.543	Law I, II, III	6	
	45.623,	45.624	Manufacturing I, II	4	
	45.627,	45.628	Value Analysis and Planning I, II	4	30
				—	
			Total Credits		96

Students following a degree program should refer to the suggested course sequence on the opposite page.

PURCHASING**Recommended Course Sequence for the 4-Year Program
Leading to the Associate in Science Degree**

	Quarter 1	Quarter 2	Quarter 3
1st Year	English I Acctg. I Mgmt. & Org. I Math. I	English II Acctg. II Mgmt. & Org. II Math. II	English III Acctg. III Mgmt. & Org. III Math. III
2nd Year	Econ. I Psych. I Corp. Fin. I West. Civ. I	Econ. II Psych. II Corp. Fin. II West. Civ. II	Econ. III Psych. III Corp. Fin. III West. Civ. III
3rd Year	E. D. P. I Stat. I Purch. I Lab.-Mgmt. Rel.	E. D. P. II Stat. II Purch. II Human Rel. I	E. D. P. III Stat. III Purch. III Human Rel. II
4th Year	Lit. I Law I Ind. Mktg. Value A. & P. I	Lit. II Law II Mfg. I Value A. & P. II	Lit. III Law III Mfg. II Prin. Mat'l Insp.

REAL ESTATE**Associate in Science Degree**

quarter hours

Basic Courses—required

10.501,	10.502,	10.503	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
30.504,	30.505,	30.506	English I, II, III	6	
30.507,	30.508,	30.509	Introduction to Literature I, II, III	6	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	36

Core Courses—required

39.511,	39.512,	39.513	Statistics I, II, III	6	
41.501,	41.502,	41.503	Accounting Principles I, II, III	6	
44.501,	44.502,	44.503	Capital Institutions and Risk Management I, II, III	6	
45.501,	45.502,	45.503	Management and Organization I, II, III	6	
45.541,	45.542,	45.543	Law I, II, III	6	30

Major Concentration Courses—required

45.649,	45.650,	45.651	Law of Real Estate I, II, III	6	
	47.501,	47.502	Real Estate Fundamentals I, II	4	
		47.506	Real Estate Construction Principles	2	
	47.508,	47.509	Real Estate Financial Analysis I, II	4	
		47.510	Real Estate Management	2	
		47.511	Residential Real Estate Appraisal	2	
	47.512,	47.513	Commercial and Industrial Real Estate Appraisal I, II	4	
47.521,	47.522,	47.523	Urban Planning, Rehabilitation and Development I, II, III	6	30
Total Credits				—	96

Students following a degree program should refer to the suggested course sequence on the opposite page.

REAL ESTATE

**Recommended Course Sequence for the 4-Year Program
Leading to the Associate in Science Degree**

	Quarter 1	Quarter 2	Quarter 3
1st Year	English I Acctg. I Mgmt. & Org. I Cap. Inst.— Risk Mgmt. I	English II Acctg. II Mgmt. & Org. II Cap. Inst.— Risk Mgmt. II	English III Acctg. III Mgmt. & Org. III Cap. Inst.— Risk Mgmt. III
2nd Year	Econ. I Law I Math. I R. E. Fund. I	Econ. II Law II Math. II R. E. Fund. II	Econ. III Law III Math. III R. E. Constr. Prin.
3rd Year	R. E. Law I Stat. I R. E. Fin. Anal. I R. E. Appraisal I	R. E. Law II Stat. II R. E. Fin. Anal. II C. & I. R. E. App. I	R. E. Law III Stat. III R. E. Mgt. C. & I. R. E. App. II
4th Year	Lit. I West. Civ. I Urban Plan. I Psych. I	Lit. II West. Civ. II Urban Plan. II Psych. II	Lit. III West. Civ. III Urban Plan. III Psych. III

TRANSPORTATION MANAGEMENT**Associate in Science Degree**

quarter hours

Basic Courses—required

10.501,	10.502,	10.503	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
30.504,	30.505,	30.506	English I, II, III	6	
30.507,	30.508,	30.509	Introduction to Literature I, II, III	6	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	36
				—	

Core Courses—required

39.511,	39.512,	39.513	Statistics I, II, III	6	
41.501,	41.502,	41.503	Accounting Principles I, II, III	6	
44.501,	44.502,	44.503	Capital Institutions and Risk Management I, II, III	6	
45.501,	45.502,	45.503	Management and Organization I, II, III	6	
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6	30
				—	

Major Concentration Courses—required

48.501,	48.502,	48.503	Transportation Management I, II, III	6	
48.504,	48.505,	48.506	Trans. Regulation and Promotion I, II, III	6	
48.511,	48.512,	48.513	Railroad Transportation and Warehousing I, II, III	6	
48.517,	48.518,	48.519	Motor Carrier Management I, II, III	6	
48.524,	48.525,	48.526	Transportation Economics and Rate Making I, II, III	6	30
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Total Credits**96**

Students following a degree program should refer to the suggested course sequence on the opposite page.

TRANSPORTATION MANAGEMENT**Recommended Course Sequence for the 4-Year Program
Leading to the Associate in Science Degree**

	Quarter 1	Quarter 2	Quarter 3
1st Year	English I Acctg. I Mgmt. & Org. I Math. I	English II Acctg. II Mgmt. & Org. II Math. II	English III Acctg. III Mgmt. & Org. III Math. III
2nd Year	Econ. I E. D. P. I Cap. Inst.— Risk Mgmt. I Trans. Mgmt. I	Econ. II E. D. P. II Cap. Inst.— Risk Mgmt. II Trans. Mgmt. II	Econ. III E. D. P. III Cap. Inst.— Risk Mgmt. III Trans. Mgmt. III
3rd Year	Psych. I Stat. I Trans. Reg. & Prom. I RR Transp. & Whs'g. I	Psych. II Stat. II Trans. Reg. & Prom. II RR Transp. & Whs'g. II	Psych. III Stat. III Trans. Reg. & Prom. III RR Transp. & Whs'g. III
4th Year	Lit. I West. Civ. I Mot. Car. Mgmt. I Transp. Econ. & Rate Mkg. I	Lit. II West. Civ. II Mot. Car. Mgmt. II Transp. Econ. & Rate Mkg. II	Lit. III West. Civ. III Mot. Car. Mgmt. III Transp. Econ. & Rate Mkg. III

COMBINED PROGRAM IN LIBERAL ARTS AND MANAGEMENT**Bachelor of Science Degree**

quarter hours

LIBERAL ARTS COURSES**Basic Courses—required**

10.501,	10.502,	10.503	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
30.504,	30.505,	30.506	English I, II, III	6	
30.507,	30.508,	30.509	Introduction to Literature I, II, III	6	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	36
				—	

Core Courses—required

16.501,	16.502,	16.503	Natural Science I, II, III	6	
21.501,	21.502,	21.503	Sociology I, II, III	6	
22.501,	22.502,	22.503	Principles of Political Science I, II, III	6	
23.504,	23.505,	23.506	U. S. History I, II, III	6	
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6	
Fine Arts:			Art, Music, or Theatre Arts	6	
Literature:			English, American, or other in translation	6	42
				—	

Elective Courses in Liberal Arts**24****MANAGEMENT COURSES****Core Courses—required**

39.511,	39.512,	39.513	Statistics I, II, III	6	
41.501,	41.502,	41.503	Accounting Principles I, II, III	6	
43.501,	43.502,	43.503	Introduction to Marketing I, II, III	6	
44.501,	44.502,	44.503	Capital Inst. and Risk Management I, II, III	6	
44.507,	44.508,	44.509	Corporate Finance I, II, III	6	
45.501,	45.502,	45.503	Management and Organization I, II, III	6	
		45.510	Labor Management Relations	2	
	45.511,	45.512	Human Relations in Personnel I, II	4	
45.541,	45.542,	45.543	Law I, II, III	6	
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6	54
				—	

Elective Courses in Business Area**18****Total Credits****174**

liberal arts

Aims

In providing the means to a modern liberal education, University College has the main objective of stimulating and guiding the self-development of the student in three main areas: first, his intellectual growth; second, the development of his character and sense of values; and, third, his preparation for, or advancement in, a career.

Intellectual growth—the development of the ability to think independently and creatively—rests upon the foundation of a sound general education. Through the Liberal Arts curricula, students are guided toward an appreciative understanding of the active discovery of ideas and methods in the areas of humanities, natural science, and social science. With this training, the student can more fully realize the basic values upon which civilization rests and can more fully participate in the intellectual, moral, and material achievement of that civilization.

Through its many programs, University College endeavors to provide experiences conducive to the development of strength of character and a sense of personal responsibility, including such personal qualities as self-reliance, integrity, perseverance, and the ability to work with others.

University College holds that there is no inconsistency between a truly liberal education and preparation for a vocation. As an adventure in intellectual discovery, a liberal education leads to the broadening and intensification of interests as the student becomes aware of his own mental strengths and weaknesses. This discovery is essential for making more intelligent and realistic appraisals of himself and his career. His career brings meaning and focus to his educational experience. His education presents both a challenge to accept responsibility and an opportunity to seek knowledge and skills for himself.

Methods

To enable each student to plan a college program in keeping with his own interests and aptitudes, a wide range of electives is offered. This does not mean that students are free to elect courses indiscriminately, for if they are to obtain a liberal education they must have training in several basic fields. Therefore, the Curriculum Committee of University College has established basic minimum requirements in each of several fields. These distribution requirements are outlined with each of the program offerings.

Programs of Study

To achieve the aims established for the programs in Liberal Arts, of serving men and women who are engaged in full-time employment during the day, the College offers curricula leading to the baccalaureate and associate degrees. The various individual courses of study are outlined on the following pages. Course descriptions are listed in numerical order by departments beginning on page 137.

The Bachelor of Science Degree

Major fields of study are offered in Economics, English, Fine Arts, Political Science, History, Psychology, and Sociology-Anthropology. Students should choose their major field of study and their electives in consultation with a program adviser.

The distribution requirements, including specific required courses, are shown with each curriculum. Upon petition, students may be permitted under certain circumstances to substitute other courses which will more adequately serve their specific career objectives.

Each curriculum normally provides for not less than 174 quarter hours of work, including at least 40 quarter hours of advanced work in a major field, and at least 30 quarter hours of elective liberal arts courses.

All candidates for the Bachelor of Science degree must have satisfactorily completed in college one full year of a modern language beyond the elementary level.

No student transferring from another college or university is eligible to receive a degree until at least 40 quarter hours of academic work have been completed at Northeastern University immediately preceding graduation.

The Associate in Science Degree

The program leading to the associate degree is offered for those desiring a general cultural background in the liberal arts and humanities, but who do not wish to pursue a major field of concentration for the baccalaureate degree.

Candidates for the Associate in Science degree in Liberal Arts must complete a minimum of 96 quarter hours of credit. This is approximately one half of the requirements (174 quarter hours) for the Bachelor of Science degree.

To provide a balanced program which will achieve the established objectives, the faculty has set a minimum credit requirement in the several areas of study as listed on page 98.

Acceptance of Credits by the College of Liberal Arts*

The College of Liberal Arts permits its students to enroll for credit in all courses in University College offered on a quarterly basis when they are pertinent to the student's program and have been approved by the Dean of the College of Liberal Arts. The credits for such courses may be applied:

1. To the total number of credits needed for graduation
2. To satisfy distribution requirements
3. To fulfill language and Major deficiencies

Credits from University College, as well as those from other accredited institutions, may not, however, be applied to the Quality Point Average of students in the College of Liberal Arts except when such credits are from courses taken as substitutes for those College of Liberal Arts courses failed by students. In such instances students must receive a grade of C or better in the University College courses and then only 2.0 quality points are applied to the student's record for each course.

Transfer of Students to the College of Liberal Arts*

Those students enrolled in University College who wish to transfer to the College of Liberal Arts must apply through the Department of Admissions of the Basic Colleges.

*One of the Basic (day) Colleges of Northeastern University

SUGGESTED COURSE SEQUENCE FOR STUDENTS FOLLOWING LIBERAL ARTS DEGREE PROGRAMS

All new students should discuss their program with a program adviser before attempting to undertake the following sequence of courses:

Quarter 1			Quarter 2			Quarter 3		
No.	Course	q.h.	No.	Course	q.h.	No.	Course	q.h.
FIRST YEAR								
10.501	Math. I	2	10.502	Math. II	2	10.503	Math. III	2
23.501	West. Civ. I	2	23.502	West. Civ. II	2	23.503	West. Civ. III	2
30.504	English I	2	30.505	English II	2	30.506	English III	2
	Core Course	2		Core Course	2		Core Course	2
SECOND YEAR								
19.501	Psych. I	2	19.502	Psych. II	2	19.503	Psych. III	2
30.507	Intro.		30.508	Intro.		30.509	Intro.	
	to Lit. I	2		to Lit. II	2		to Lit. III	2
	Core Course	2		Core Course	2		Core Course	2
	Maj. Con.			Maj. Con.			Maj. Con.	
	Course	2		Course	2		Course	2
THIRD YEAR								
39.501	Econ. I	2	39.502	Econ. II	2	39.503	Econ. III	2
	Language	3		Language	3		Language	3
	Core Course			Core Course			Core Course	
	or Maj. Con.			or Maj. Con.			or Maj. Con.	
	Course	2		Course	2		Course	2
FOURTH YEAR								
	Language	3		Language	3		Language	3
	Core Course	2		Core Course	2		Core Course	2
	Core Course			Core Course			Core Course	
	or Maj. Con.			or Maj. Con.			or Maj. Con.	
	Course	2		Course	2		Course	2

Fifth and succeeding years: Program should include at least one Core Course and one Major Concentration Course each year.

ECONOMICS**Bachelor of Science Degree**

quarter hours

Basic Courses—required

10.501,	10.502,	10.503	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
30.504,	30.505,	30.506	English I, II, III	6	
30.507,	30.508,	30.509	Introduction to Literature I, II, III	6	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	36
				—	

Core Courses—required

16.501,	16.502,	16.503	Natural Science I, II, III	6	
21.501,	21.502,	21.503	Sociology I, II, III	6	
22.501,	22.502,	22.503	Principles of Political Science I, II, III	6	
23.504,	23.505,	23.506	U. S. History I, II, III	6	
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6	
Fine Arts:			Art, Music, or Theatre Arts	6	
Literature:			English, American, or other in translation	6	
Modern Language:*			Elementary	9	
			Intermediate	9	
Science or Mathematics				6	66
				—	

Major Concentration Courses—required

		39.500	Economic Geography	2	
39.507,	39.508,	39.509	Intermediate Economic Theory I, II, III	6	
39.511,	39.512,	39.513	Statistics I, II, III	6	
	39.517,	39.518	Money and Banking I, II	4	
		39.519	Public Finance	2	
		39.521	Introduction to Economic Growth and Development	2	
		39.522	Economic Development	2	
		39.525	American Economic History	2	
		39.526	Government and Business	2	
		39.527	Labor Economics	2	
	39.528,	39.529	International Economics I, II	4	
		39.530	Comparative Economic Systems	2	
	39.531,	39.532	Business Cycles I, II	4	
		39.533	Business Planning and Research	2	
	39.536,	39.537	Statistical Methods in Forecasting I, II	4	
		39.540	History of Economic Thought	2	48
				—	

Elective Courses**

24

Total Credits

174

*One full year of a modern language beyond the elementary level is a requirement for graduation.

**While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses in a variety of fields beyond the major.

ENGLISH**Bachelor of Science Degree**

				quarter hours	
Basic Courses—required					
10.501,	10.502,	10.503	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
30.504,	30.505,	30.506	English I, II, III	6	
30.507,	30.508,	30.509	Introduction to Literature I, II, III	6	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	36
					—
Core Courses—required					
16.501,	16.502,	16.503	Natural Science I, II, III	6	
21.501,	21.502,	21.503	Sociology I, II, III	6	
22.501,	22.502,	22.503	Principles of Political Science I, II, III	6	
23.504,	23.505,	23.506	U. S. History I, II, III	6	
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6	
30.531,	30.532,	30.533	Western World Literature I, II, III	6	
Fine Arts:			Art, Music, or Theatre Arts	6	
Modern Language:*			Elementary	9	
			Intermediate	9	
Science or Mathematics				6	66
					—

(continued on following page)

*One full year of a modern language beyond the elementary level is a requirement for graduation.

Major Concentration Courses—required

		29.525	Modern British Drama	}	
			or		2
		29.526	Modern American Drama	}	
		30.517	Intermediate Writing		2
		30.521	The English Language		2
		30.522	Introduction to Semantics		2
30.534,	30.535,	30.536	Western World Literature IV, V, VI		6
30.541,	30.542,	30.543	English Literature I, II, III		6
30.544,	30.545,	30.546	American Literature I, II, III		6
30.551,	30.552,	30.553	Chaucer I, II, III	}	
			or		6
30.554,	30.555,	30.556	Shakespeare I, II, III	}	
30.557,	30.558,	30.559	Restoration Literature, The Age of Pope and Swift, The Age of Johnson		
			or		6
30.571,	30.572,	30.573	Romantic Poets of the 19th Century I, II, III		
The remaining eight hours must be taken from the following courses:					
		30.574	The 18th-Century English Novel		2
		30.575	The 19th-Century English Novel		2
		30.576	The 20th-Century English Novel		2
		30.581	The American Short Story		2
		30.582	The 19th-Century American Novel		2
		30.583	The 20th-Century American Novel		2
		30.584	Contemporary American Poetry		2
					46
Elective Courses*					26
Total Credits					174

*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses in a variety of fields beyond the major.

FINE ARTS

Bachelor of Science Degree

				quarter hours	
Basic Courses—required					
10.501,	10.502,	10.503	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
30.504,	30.505,	30.506	English I, II, III	6	
30.507,	30.508,	30.509	Introduction to Literature I, II, III	6	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	36
				—	
Core Courses—required					
16.501,	16.502,	16.503	Natural Science I, II, III	6	
21.501,	21.502,	21.503	Sociology I, II, III	6	
22.501,	22.502,	22.503	Principles of Political Science I, II, III	6	
23.504,	23.505,	23.506	U. S. History I, II, III	6	
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6	
Fine Arts:			Art, Music, or Theatre Arts	6	
Literature:			English, American, or other in translation	6	
Modern Language:*			Elementary	9	
			Intermediate	9	
Science or Mathematics				6	66
				—	
Major Concentration Courses—required					
27.504,	27.505,	27.506	Survey of Western Art I, II, III	6	
		27.591	Art Seminar (senior level)	2	

In addition to the two courses above, required of all Fine Arts majors, each student will select a minimum of 36 quarter hours from either Area I or Area II.

Area I—Art History Major

		27.507	Ancient Architecture	2
		27.508	Medieval and Renaissance Architecture	2
		27.509	European Architecture	2
		27.511	History of Ancient Art	2
		27.512	History of Medieval Art	2
		27.513	Italian Renaissance Art	2
		27.514	European Art	2
		27.515	Modern Painting	2
		27.521	Spanish Art	2
		27.522	French Art	2
		27.523	English Art	2
27.524,	27.525,	27.526	History of American Art I, II, III	6
27.531,	27.532,	27.533	Oriental Art I, II, III	6
		27.534	Russian Art	2
		27.535	African Art	2
		27.536	Latin American Art	2

(continued on following page)

*One full year of a modern language beyond the elementary level is a requirement for graduation.

Area II—Applied Art Major**Required:**

27.541,	27.542,	27.543	Drawing I, II, III	9
27.561,	27.562,	27.563	Basic Color and Design	9

Eighteen hours must be taken from the following courses:

		27.544	Graphic Arts—Woodcutting	3	
		27.545	Graphic Arts—Etching	3	
		27.546	Graphic Arts—Lithography	3	
27.551,	27.552,	27.553	Painting—Basic Level I, II, III	9	
		27.554	Painting—Advanced Level	3	
		27.564	Advanced Color and Design	3	
27.571,	27.572,	27.573	Business Commercial Design I, II, III	9	
		27.574	Advanced Commercial Design	3	
27.577,	27.578,	27.579	Stained Glass Design I, II, III	9	
		27.581	Basic Sculpture	3	
	27.584,	27.585	Ceramics I, II	6	36

Elective Courses***28****Total Credits****174**

*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses in a variety of fields beyond the major.

HISTORY**Bachelor of Science Degree****Basic Courses—required**

				quarter hours	
10.501,	10.502,	10.503	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
30.504,	30.505,	30.506	English I, II, III	6	
30.507,	30.508,	30.509	Introduction to Literature I, II, III	6	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	36
				—	

Core Courses—required

16.501,	16.502,	16.503	Natural Science I, II, III	6	
21.501,	21.502,	21.503	Sociology I, II, III	6	
22.501,	22.502,	22.503	Principles of Political Science I, II, III	6	
23.504,	23.505,	23.506	U. S. History I, II, III	6	
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6	
Fine Arts:			Art, Music, or Theatre Arts	6	
Literature:			English, American, or other in translation	6	
Modern Language:*			Elementary	9	
			Intermediate	9	
Science or Mathematics				6	66
				—	

Major Concentration Courses—required

Each student will select a minimum of 40 hours from the following areas, with the provision that at least five courses must be completed from each area:

Area I

23.521	Ancient Middle East	2
23.522	Ancient Greece	2
23.523	Ancient Rome	2
23.524	Early Middle Ages	2
23.525	Late Middle Ages	2
23.526	Early Modern Europe	2
23.527	England, 500–1603	2

Area II

23.541	Europe, 1688–1789	2
23.542	Europe, 1789–1870	2
23.543	Europe, 1870–1914	2
23.544	Europe, 1914–1939	2
23.545	Europe since 1939	2
23.548	England, 1603–1815	2
23.549	England since 1815	2
23.552	English Constitutional History to 1485	2
23.553	English Constitutional History since 1485	2
23.554	France since 1815	2
23.555	Germany since 1815	2
23.556	Italy since 1815	2
23.557	Ireland since 1800	2

(continued on following page)

*One full year of a modern language beyond the elementary level is a requirement for graduation.

Area III

23.561	Colonial America to 1689	2
23.562	Colonial America, 1689–1763	2
23.563	American Revolution and Constitution	2
23.564	Topics in American Constitutional History to 1900	2
23.565	Topics in 20th-Century American Constitutional History	2
23.566	United States since 1933	2
23.567	Topics in American Diplomatic History	2
23.568	Topics in American Social History	2
23.569	Topics in American Economic History	2

Area IV

23.581	Latin America to 1826	2
23.582	Latin America, 1826–1920	2
23.583	Contemporary Latin America	2
23.584	The Far East before 1850	2
23.585	China since 1850	2
23.586	Japan since 1850	2
23.588	Africa North of Sahara	2
23.589	Africa South of Sahara	2
23.591	Modern Middle East	2
23.592	India and Pakistan	2
23.593	Southeast Asia	2
23.594	Russia, 1450–1801	2
23.595	Russia, 1801–1917	2
23.596	Russia since 1917	2
		40

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Elective Courses***32****Total Credits****174**

*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses in a variety of fields beyond the major.

LIBERAL ARTS

Associate in Science Degree

quarter hours

Basic Courses—required

10.501,	10.502,	10.503	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
30.504,	30.505,	30.506	English I, II, III	6	
30.507,	30.508,	30.509	Introduction to Literature I, II, III	6	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	36
				—	

Core Courses—required

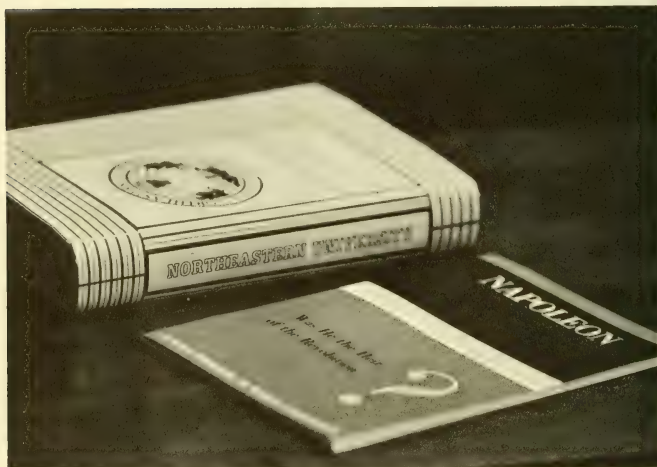
21.501,	21.502,	21.503	Sociology I, II, III	6	
22.501,	22.502,	22.503	Principles of Political Science I, II, III	6	
23.504,	23.505,	23.506	U. S. History I, II, III	6	
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6	
Fine Arts:			Art, Music, or Theatre Arts	6	
Literature:			English, American, or other in translation	6	36
				—	

Electives

24

Total Credits

96



POLITICAL SCIENCE**Bachelor of Science Degree**

quarter hours

10.501,	10.502,	10.503	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
30.504,	30.505,	30.506	English I, II, III	6	
30.507,	30.508,	30.509	Introduction to Literature I, II, III	6	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	36
				—	

Core Courses—required

16.501,	16.502,	16.503	Natural Science I, II, III	6	
21.501,	21.502,	21.503	Sociology I, II, III	6	
22.501,	22.502,	22.503	Principles of Political Science I, II, III	6	
23.504,	23.505,	23.506	U. S. History I, II, III	6	
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6	
Fine Arts:			Art, Music, or Theatre Arts	6	
Literature:			English, American, or other in translation	6	
Modern Language:*			Elementary	9	
			Intermediate	9	
Science or Mathematics				6	66
				—	

(continued on following page)



*One full year of a modern language beyond the elementary level is a requirement for graduation.

Major Concentration Courses—required

22.504	Introduction to Political Theory	2
22.505	Contemporary Political Theory	2
22.506	American Political Thought	2

Each student will select a minimum of 34 hours from the following areas:

Area I

22.511	American National Government	2
22.512	Urban and Metropolitan Government	2
22.513	Political Parties and Pressure Groups	2
22.514	American Constitutional Law	2
22.515	Civil Rights	2
22.516	Public Administration I	2
22.517	Public Administration II	2
22.518	Government and Politics of the States	2

Area II

22.521	Comparative Government I	2
22.522	Comparative Government II	2
22.523	Government and Politics of Latin America	2
22.524	Government and Politics of the Middle East	2
22.525	Government and Politics of the Far East	2
22.526	Government and Politics of Africa	2
22.527	Communism in Eastern Europe	2

Area III

22.531	International Relations	2
22.532	International Organization	2
22.533	American Foreign Policy	2
22.534	Soviet Foreign Policy	2
		40

Elective Courses***32****Total Credits****174**

*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses in a variety of fields beyond the major.

PSYCHOLOGY**Bachelor of Science Degree**

quarter hours

Basic Courses—required

10.501,	10.502,	10.503	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
30.504,	30.505,	30.506	English I, II, III	6	
30.507,	30.508,	30.509	Introduction to Literature I, II, III	6	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	36

Core Courses—required

16.501,	16.502,	16.503	Natural Science I, II, III	6	
21.501,	21.502,	21.503	Sociology I, II, III	6	
22.501,	22.502,	22.503	Principles of Political Science I, II, III	6	
23.504,	23.505,	23.506	U. S. History I, II, III	6	
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6	
Fine Arts:			Art, Music, or Theatre Arts	6	
Literature:			English, American, or other in translation	6	
Modern Language:*			Elementary	9	
			Intermediate	9	
Science or Mathematics				6	66

Major Concentration Courses—required

19.504,	19.505,	19.506	Statistics in Psychology I, II, III	6	
19.551,	19.552,	19.553	Experimental Psychology I, II, III	9	
19.561,	19.562,	19.563	Historical Development of Psychology I, II, III	6	

In addition to the courses listed above, required of all Psychology majors, each student will select a minimum of 22 hours from the following courses:

19.511,	19.512,	19.513	Child and Adolescent Psychology I, II, III	6	
		19.521	Personality I	2	
		19.522	Personality II	2	
		19.523	Motivation	2	
	19.524,	19.525	Social Psychology I, II	4	
		19.531	Psychological Testing	2	
19.541,	19.542,	19.543	Abnormal Psychology I, II, III	6	
		19.571	Seminar in Psychology	2	43

Elective Courses****29****Total Credits****174**

*One full year of a modern language beyond the elementary level is a requirement for graduation.

**While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses in a variety of fields beyond the major.

SOCIOLOGY-ANTHROPOLOGY**Bachelor of Science Degree**

quarter hours

Basic Courses—required

10.501,	10.502,	10.503	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
30.504,	30.505,	30.506	English I, II, III	6	
30.507,	30.508,	30.509	Introduction to Literature I, II, III	6	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	36

Core Courses—required

16.501,	16.502,	16.503	Natural Science I, II, III	6	
21.501,	21.502,	21.503	Sociology I, II, III	6	
22.501,	22.502,	22.503	Principles of Political Science I, II, III	6	
23.504,	23.505,	23.506	U. S. History I, II, III	6	
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6	
Fine Arts:			Art, Music, or Theatre Arts	6	
Literature:			English, American, or other in translation	6	
Modern Language:*			Elementary	9	
			Intermediate	9	
Science or Mathematics				6	66

Major Concentration Courses—required

		20.501	Introduction to Physical Anthropology	2	
	20.502,	20.503	Cultural Anthropology I, II	4	
		20.521	Culture and Personality	2	
21.512,	21.513,	21.514	Social Research Methods I, II, III	6	
		21.517	Foundations of Sociological Theory	2	
		21.518	Contemporary Sociological Theory I	2	
		21.519	Contemporary Sociological Theory II	2	
		21.528	Social Stratification	2	
		21.531	Social Change	2	
		21.534	Social Control	2	
		21.547	Social Problems	2	

In addition to the courses listed above, required of all Sociology majors, each student will select a minimum of 16 hours from either Area I or Area II. (See following page.)

*One full year of a modern language beyond the elementary level is a requirement for graduation.

Area I—Sociology-Social Work Major**Required:**

21.538,	21.539,	21.540	Introduction to Social Welfare I, II, III	6
21.543,	21.544,	21.545	Introduction to Social Work Practice I, II, III	6
(may be waived in special circumstances)				

The remaining four hours must be taken from the following courses:

21.548,	21.549	Criminology I, II	4
	21.550	Juvenile Delinquency	2
21.551,	21.552	Family and Marriage I, II	4
21.553,	21.554	Intergroup Relations I, II	4
	21.557	Urban Sociology	2
	21.558	Community Analysis	2
	21.560	Medical Sociology	2
	21.563	Social Gerontology	2
	21.567	Population and Demography	2
	21.570	Sociology of Occupations and Professions	2
	21.573	Sociology of Industry	2
	21.575	Sociology of Formal Organizations	2

Area II—Sociology-Anthropology Major**Required:**

20.531	Primitive Social Organization	2
21.567	Population and Demography	2

Eight hours must be taken from the following courses:

21.548,	21.549	Criminology I, II	4
	21.550	Juvenile Delinquency	2
21.551,	21.552	Family and Marriage I, II	4
21.553,	21.554	Intergroup Relations I, II	4
	21.557	Urban Sociology	2
	21.558	Community Analysis	2
	21.560	Medical Sociology	2
	21.563	Social Gerontology	2
	21.570	Sociology of Occupations and Professions	2
	21.573	Sociology of Industry	2
	21.575	Sociology of Formal Organizations	2

Four hours must be taken from the following courses:

20.532	Primitive Religion	2
20.533	Acculturation	2
20.537	Anthropological Theory	2
20.541	North American Indian	2
20.544	African Peoples and Culture	2
20.547	Latin American Peoples and Culture	2
		44
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Elective Courses***28****Total Credits****174**

*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses in a variety of fields beyond the major.



law enforcement

PROGRAMS OF STUDY

Bachelor of Science Degree

Major fields of study are offered in Law Enforcement, Security, and Correctional Practices. Students should choose their major field of study and their electives in consultation with a program adviser.

The distribution requirements, including certain required courses, are shown with each curriculum. Upon petition, students may be permitted under certain circumstances to substitute other courses which will more adequately serve their specific career objectives.

Each curriculum provides for not less than 174 quarter hours of work, including at least 40 quarter hours of advanced work in a major field.

No student transferring from another college or university is eligible to receive a degree until at least 40 quarter hours of academic work have been completed at Northeastern University immediately preceding graduation.

Associate in Science Degree

The program leading to the associate degree is offered for those who wish to obtain a general background in Law Enforcement, Security, or Correctional Practices but who do not wish to pursue a major field of concentration for the baccalaureate degree.

Candidates for the Associate in Science degree must complete a minimum of 96 quarter hours of credit. This is approximately one half of the requirements for the Bachelor of Science degree.

To provide a balanced program which will achieve the established objectives, the faculty has set a minimum credit requirement in the areas of study outlined on the following pages.

CORRECTIONAL PRACTICES**Bachelor of Science Degree**
quarter hours**Basic Courses—required**

10.501,	10.502,	10.503	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
30.504,	30.505,	30.506	English I, II, III	6	
30.507,	30.508,	30.509	Introduction to Literature I, II, III	6	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	36
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Core Courses—required

		19.522	Psychology of Personality	2	
	19.524,	19.525	Social Psychology I, II	4	
19.541,	19.542,	19.543	Abnormal Psychology I, II, III	6	
21.501,	21.502,	21.503	Sociology I, II, III	6	
		21.534	Social Control	2	
		21.547	Social Problems	2	
	21.548,	21.549	Criminology I, II	4	
		21.550	Juvenile Delinquency	2	
	21.553,	21.554	Intergroup Relations I, II	4	
		21.557	Urban Sociology	2	
22.501,	22.502,	22.503	Principles of Political Science I, II, III	6	
		22.514	American Constitutional Law	2	
		22.515	Civil Rights	2	
	22.516,	22.517	Public Administration I, II	4	
23.504,	23.505,	23.506	U. S. History I, II, III	6	
	45.511,	45.512	Human Relations in Personnel I, II	4	58
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Major Concentration Courses—required

		94.501	Administration of Justice	2	
		94.502	Criminal Law	2	
	94.503,	94.504	Evidence and Court Procedure I, II	4	
94.508,	94.509,	94.510	Criminal Investigation and Case Preparation I, II, III	6	
94.525,	94.526,	94.527	Law Enforcement Identification and Records I, II, III	6	
		94.532	Research Methods in Criminal Justice	2	
		94.544	The American Correctional System	2	
	94.546,	94.547	Social Deviance I, II	4	
	94.549,	94.550	Treatment of Offenders I, II	4	
94.551,	94.552,	94.553	Correctional Administration I, II, III	6	
		94.557	Investigative Report Writing	2	
		94.565	Seminar in Delinquency Prevention	2	
94.567,	94.568,	94.569	Probation and Parole Practices I, II, III	6	
94.574,	94.575,	94.576	Juvenile Corrections I, II, III	6	
		94.593	Seminar in Correctional Program Management	2	56
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Elective Courses***24****Total Credits****174**

*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses from any other curricula in the University College Catalog.

CORRECTIONAL PRACTICES**Recommended Course Sequence for the 8-Year Program
Leading to the Bachelor of Science Degree**

	Quarter 1	Quarter 2	Quarter 3
1st Year	English I West. Civ. I Admin. of Justice Criminal Law	English II West. Civ. II Amer. Corr. Sys. Evid. & Court Proc. I	English III West. Civ. III Inv. Rep. Writ. Evid. & Court Proc. II
2nd Year	Soc. I Lit. I Crim. Investig. & Case Prep. I Prob. & Parole Practices I	Soc. II Lit. II Crim. Investig. & Case Prep. II Prob. & Parole Practices II	Soc. III Lit. III Crim. Investig. & Case Prep. III Prob. & Parole Practices III
3rd Year	Psych. I Soc. Control Soc. Dev. I L. E. Ident. & Records I	Psych. II Soc. Prob. Soc. Dev. II L. E. Ident. & Records II	Psych. III Urban Soc. Soc. Dev. III L. E. Ident. & Records III
4th Year	Econ. I Criminology I Psych. of Pers. Treat. of Off. I	Econ. II Criminology II Soc. Psych. I Treat. of Off. II	Econ. III Juve. Delin. Soc. Psych. II Res. Meth. in Crim. Justice
5th Year	Math. I Pol. Sci. I Juve. Corr. I Elective	Math. II Pol. Sci. II Juve. Corr. II Elective	Math. III Pol. Sci. III Elective Elective
6th Year	Abnorm. Psych. I Amer. Const. Law Corr. Admin. I U. S. Hist. I	Abnorm. Psych. II Civil Rights Corr. Admin. II U. S. Hist. II	Abnorm. Psych. III Sem. in Delin. Prevention Corr. Admin. III U. S. Hist. III
7th Year	Intergroup Rel. I Pub. Admin. I Elective Elective	Intergroup Rel. II Pub. Admin. II Elective Elective	Elective Elective Elective Elective
8th Year	Human Rel. I Elective	Human Rel. II Elective	Sem. in Corr. Prog. Mgmt. Elective

CORRECTIONAL PRACTICES**Associate in Science Degree**

quarter hours

Basic Courses—required

19.501,	19.502,	19.503	Psychology I, II, III	6	
30.504,	30.505,	30.506	English I, II, III	6	12
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Core Courses—required

19.541,	19.542,	19.543	Abnormal Psychology I, II, III	6	
21.501,	21.502,	21.503	Sociology I, II, III	6	
		21.534	Social Control	2	
		21.547	Social Problems	2	
	21.548,	21.549	Criminology I, II	4	
		21.550	Juvenile Delinquency	2	
	21.553,	21.554	Intergroup Relations I, II	4	
		21.557	Urban Sociology	2	
		22.514	American Constitutional Law	2	
		22.515	Civil Rights	2	32
				—	

Major Concentration Courses—required

		94.501	Administration of Justice	2	
		94.502	Criminal Law	2	
	94.503,	94.504	Evidence and Court Procedure I, II	4	
94.525,	94.526,	94.527	Law Enforcement Identification and Records I, II, III	6	
		94.557	Investigative Report Writing	2	
		94.565	Seminar in Delinquency Prevention	2	
	94.546,	94.547	Social Deviance I, II	4	
	94.549,	94.550	Treatment of Offenders I, II	4	
94.551,	94.552,	94.553	Correctional Administration I, II, III	6	
		94.532	Research Methods in Criminal Justice	2	
94.574,	94.575,	94.576	Juvenile Corrections I, II, III	6	40
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Elective Courses***12****Total Credits****96**

*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses from any other curricula in the University College Catalog.

CORRECTIONAL PRACTICES**Recommended Course Sequence for the 4-Year Program
Leading to the Associate in Science Degree**

All new students should discuss their programs with advisers before undertaking the following sequence of courses:

	Quarter 1	Quarter 2	Quarter 3
1st Year	English I Admin. of Justice Criminal Law L. E. Ident. & Records I	English II Soc. Dev. I Evid. & Court Proc. I L. E. Ident. & Records II	English III Soc. Dev. II Evid. & Court Proc. II L. E. Ident. & Records III
2nd Year	Soc. I Inv. Rep. Writ. Criminology I Elective	Soc. II Treat. of Off. I Criminology II Elective	Soc. III Treat. of Off. II Juve. Delin. Elective
3rd Year	Psych. I Soc. Control Juve. Corr. I Elective	Psych. II Soc. Prob. Juve. Corr. II Elective	Psych. III Urban Soc. Juve. Corr. III Elective
4th Year	Abnorm. Psych. I Amer. Const. Law Intergroup Rel. I Corr. Admin. I Elective	Abnorm. Psych. II Civil Rights Intergroup Rel. II Corr. Admin. II Elective	Abnorm. Psych. III Sem. in Delin. Prevention Corr. Admin. III Res. Meth. in Crim. Justice Elective

LAW ENFORCEMENT**Bachelor of Science Degree**
quarter hours**Basic Courses—required**

10.501,	10.502,	10.503	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
30.504,	30.505,	30.506	English I, II, III	6	
30.507,	30.508,	30.509	Introduction to Literature I, II, III	6	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	36

Core Courses—required

	19.524,	19.525	Social Psychology I, II	4	
19.541,	19.542,	19.543	Abnormal Psychology I, II, III	6	
21.501,	21.502,	21.503	Sociology I, II, III	6	
		21.534	Social Control	2	
		21.547	Social Problems	2	
	21.548,	21.549	Criminology I, II	4	
		21.550	Juvenile Delinquency	2	
	21.553,	21.554	Intergroup Relations I, II	4	
		21.557	Urban Sociology	2	
22.501,	22.502,	22.503	Principles of Political Science I, II, III	6	
		22.514	American Constitutional Law	2	
		22.515	Civil Rights	2	
	22.516,	22.517	Public Administration I, II	4	
23.504,	23.505,	23.506	U. S. History I, II, III	6	52

Major Concentration Courses—required

		94.501	Administration of Justice	2	
		94.502	Criminal Law	2	
	94.503,	94.504	Evidence and Court Procedure I, II	4	
94.508,	94.509,	94.510	Criminal Investigation and Case Preparation I, II, III	6	
	94.514,	94.515	Police Interrogation I, II	4	
94.520,	94.521,	94.522	Traffic Law Enforcement I, II, III	6	
94.525,	94.526,	94.527	Law Enforcement Identification and Records I, II, III	6	
		94.530	Police Public Relations	2	
		94.531	Police Community Relations	2	
		94.532	Research Methods in Criminal Justice	2	
	94.536,	94.537	Police Patrol I, II	4	
	94.541,	94.542	Introduction to Criminalistics I, II	4	
		94.557	Investigative Report Writing	2	
		94.560	Police Supervision	2	
		94.561	Police Juvenile Methods	2	
		94.565	Seminar in Delinquency Prevention	2	
94.571,	94.572,	94.573	Law Enforcement Management and Planning I, II, III	6	
		94.590	Seminar in Law Enforcement	2	60

Elective Courses***26****Total Credits****174**

*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses from any other curricula in the University College Catalog.

LAW ENFORCEMENT**Recommended Course Sequence for the 8-Year Program
Leading to the Bachelor of Science Degree**

All new students should discuss their programs with advisers before undertaking the following sequence of courses:

	Quarter 1	Quarter 2	Quarter 3
1st Year	English I West. Civ. I Admin. of Justice Criminal Law	English II West. Civ. II Police Interrog. I Evid. & Court Proc. I	English III West. Civ. III Police Interrog. II Evid. & Court Proc. II
2nd Year	Soc. I Lit. I Crim. Investig. & Case Prep. I Police Patrol I	Soc. II Lit. II Crim. Investig. & Case Prep. II Police Patrol II	Soc. III Lit. III Crim. Investig. & Case Prep. III Inv. Rep. Writ.
3rd Year	Psych. I Soc. Control Traff. Law Enf. I Police Juve. Meth.	Psych. II Soc. Prob. Traff. Law Enf. II Intro. to Crim. I	Psych. III Urban Soc. Traff. Law Enf. III Intro. to Crim. II
4th Year	Econ. I Criminology I L. E. Ident. & Records I Police Com. Rel.	Econ. II Criminology II L. E. Ident. & Records II Police Pub. Rel.	Econ. III Juve. Delin. L. E. Ident. & Records III Res. Meth. in Crim. Justice
5th Year	Math. I Pol. Sci. I Abnorm. Psych. I Law Enf. Mgmt. & Planning I	Math. II Pol. Sci. II Abnorm. Psych. II Law Enf. Mgmt. & Planning II	Math. III Pol. Sci. III Abnorm. Psych. III Law Enf. Mgmt. & Planning III
6th Year	Soc. Psych. I Amer. Const. Law U. S. Hist. I Public Admin. I	Soc. Psych. II Civil Rights U. S. Hist. II Public Admin. II	Elective Police Supv. U. S. Hist. III
7th Year	Intergroup Rel. I Elective Elective	Intergroup Rel. II Elective Elective	Elective Elective Elective
8th Year	Sem. in Delin. Prevention Elective	Sem. in Law Enforcement Elective	Elective Elective

LAW ENFORCEMENT**Associate in Science Degree**

				quarter hours	
Basic Courses—required					
19.501,	19.502,	19.503	Psychology I, II, III	6	
30.504,	30.505,	30.506	English I, II, III	6	12
				—	
Core Courses—required					
19.541,	19.542,	19.543	Abnormal Psychology I, II, III	6	
21.501,	21.502,	21.503	Sociology I, II, III	6	
		21.534	Social Control	2	
		21.547	Social Problems	2	
	21.548,	21.549	Criminology I, II	4	
		21.550	Juvenile Delinquency	2	
	21.553,	21.554	Intergroup Relations I, II	4	
		21.557	Urban Sociology	2	
		22.514	American Constitutional Law	2	
		22.515	Civil Rights	2	32
				—	
Major Concentration Courses—required					
		94.501	Administration of Justice	2	
		94.502	Criminal Law	2	
	94.503,	94.504	Evidence and Court Procedure I, II	4	
94.508,	94.509,	94.510	Criminal Investigation and Case Preparation I, II, III	6	
	94.514,	94.515	Police Interrogation I, II	4	
94.520,	94.521,	94.522	Traffic Law Enforcement I, II, III	6	
		94.530	Police Public Relations	2	
		94.531	Police Community Relations	2	
		94.532	Research Methods in Criminal Justice	2	
	94.536,	94.537	Police Patrol I, II	4	
	94.541,	94.542	Introduction to Criminalistics I, II	4	
		94.561	Police Juvenile Methods	2	40
				—	
Elective Courses*					12
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Total Credits					96

*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses from any other curricula in the University College Catalog.

LAW ENFORCEMENT**Recommended Course Sequence for the 4-Year Program
Leading to the Associate in Science Degree**

All new students should discuss their programs with advisers before undertaking the following sequence of courses:

	Quarter 1	Quarter 2	Quarter 3
1st Year	English I Admin. of Justice Criminal Law Police Interrog. I	English II Intro. to Crim. I Evid. & Court Proc. I Police Interrog. II	English III Intro. to Crim. II Evid. & Court Proc. II Elective
2nd Year	Soc. I Crim. Investig. & Case Prep. I Police Patrol I Criminology I	Soc. II Crim. Investig. & Case Prep. II Police Patrol II Criminology II	Soc. III Crim. Investig. & Case Prep. III Elective Juve. Delin.
3rd Year	Psych. I Soc. Control Traff. Law Enf. I Police Juve. Meth.	Psych. II Soc. Prob. Traff. Law Enf. II Intergroup Rel. I	Psych. III Urban Soc. Traff. Law Enf. III Intergroup Rel. II
4th Year	Abnorm. Psych. I Police Com. Rel. Amer. Const. Law Elective	Abnorm. Psych. II Police Pub. Rel. Civil Rights Elective	Abnorm. Psych. III Res. Meth. in Crim. Justice Elective Elective

SECURITY**Bachelor of Science Degree****Basic Courses—required**

quarter hours

10.501,	10.502,	10.503	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
30.504,	30.505,	30.506	English I, II, III	6	
30.507,	30.508,	30.509	Introduction to Literature I, II, III	6	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	36

Core Courses—required

		19.532	Industrial Psychology	2	
21.501,	21.502,	21.503	Sociology I, II, III	6	
		21.547	Social Problems	2	
	21.548,	21.549	Criminology I, II	4	
		22.513	American Constitutional Law	2	
41.501,	41.502,	41.503	Accounting Principles I, II, III	6	
44.501,	44.502,	44.503	Capital Institutions and		
			Risk Management I, II, III	6	
44.514,	44.515,	44.516	Property and Casualty Insurance I, II, III	6	
45.501,	45.502,	45.503	Management and Organization I, II, III	6	
		45.510	Labor Management Relations	2	
	45.511,	45.512	Human Relations in Personnel I, II	4	
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6	
	45.620,	45.621	Industrial Safety I, II	4	56

Major Concentration Courses—required

		94.501	Administration of Justice	2	
		94.502	Criminal Law	2	
	94.503,	94.504	Evidence and Court Procedure I, II	4	
94.508,	94.509,	94.510	Criminal Investigation and		
			Case Preparation I, II, III	6	
	94.514,	94.515	Police Interrogation I, II	4	
94.525,	94.526,	94.527	Law Enforcement Identification		
			and Records I, II, III	6	
	94.536,	94.537	Police Patrol I, II	4	
	94.541,	94.542	Introduction to Criminalistics I, II	4	
		94.557	Investigative Report Writing	2	
		94.560	Police Supervision	2	
94.571,	94.572,	94.573	Law Enforcement Management and		
			Planning I, II, III	6	
94.577,	94.578,	94.579	Government Security Programs I, II, III	6	
		94.582	Document Control	2	
		94.583	Industrial Fire Prevention	2	
	94.584,	94.585	Plant Protection I, II	4	
		94.588	Retail Security	2	
		94.591	Seminar in Industrial Security	2	60

Elective Courses***22****Total Credits****174**

*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses from any other curricula in the University College Catalog.

SECURITY**Recommended Course Sequence for the 8-Year Program
Leading to the Bachelor of Science Degree**

	Quarter 1	Quarter 2	Quarter 3
1st Year	English I Admin. of Justice Criminal Law	English II Plant Protec. I Evid. & Court Proc. I	English III Plant Protec. II Evid. & Court Proc. II
2nd Year	Soc. I West. Civ. I Crim. Investig. & Case Prep. I Govt. Sec. Prog. I	Soc. II West. Civ. II Crim. Investig. & Case Prep. II Govt. Sec. Prog. II	Soc. III West. Civ. III Crim. Investig. & Case Prep. III Govt. Sec. Prog. III
3rd Year	Psych. I Lit. I Police Interrog. I Ind. Fire Prev.	Psych. II Lit. II Police Interrog. II Ind. Psych.	Psych. III Lit. III Inv. Rep. Writ. Sem. in Ind. Sec.
4th Year	Acctg. I E. D. P. I Ind. Safety I Retail Sec. I	Acctg. II E. D. P. II Ind. Safety II Retail Sec. II	Acctg. III E. D. P. III Elective Elective
5th Year	Econ. I Mgmt. & Org. I L. E. Ident. & Records I Police Patrol I	Econ. II Mgmt. & Org. II L. E. Ident. & Records II Police Patrol II	Econ. III Mgmt. & Org. III L. E. Ident. & Records III Elective
6th Year	Math. I Cap. Inst.- Risk Mgmt. I L. E. Mgmt. & Planning I Elective	Math. II Cap. Inst.- Risk Mgmt. II L. E. Mgmt. & Planning II Elective	Math. III Cap. Inst.- Risk Mgmt. III L. E. Mgmt. & Planning III Elective
7th Year	Prop.-Cas. Ins. I Ind. Psych. Amer. Const. Law Elective	Prop.-Cas. Ins. II Human Rel. I Lab.-Mgmt. Rel. Elective	Prop.-Cas. Ins. III Human Rel. II Elective Elective
8th Year	Criminology I Elective Elective	Criminology II Elective Elective	Soc. Prob. Elective Elective

SECURITY**Associate in Science Degree**

				quarter hours	
Basic Courses—required					
19.501, 19.502, 19.503	Psychology I, II, III		6		
30.504, 30.505, 30.506	English I, II, III		6	12	
				—	
Core Courses—required					
	19.532	Industrial Psychology	2		
21.501, 21.502, 21.503	Sociology I, II, III		6		
	21.548, 21.549	Criminology I, II	4		
45.501, 45.502, 45.503	Management and Organization I, II, III		6		
	45.510	Labor Management Relations	2		
	45.511, 45.512	Human Relations in Personnel I, II	4		
45.570, 45.571, 45.572	Electronic Data Processing I, II, III		6		
	45.620, 45.621	Industrial Safety I, II	4	34	
				—	
Major Concentration Courses—required					
	94.501	Administration of Justice	2		
	94.502	Criminal Law	2		
	94.503, 94.504	Evidence and Court Procedure I, II	4		
94.508, 94.509, 94.510	Criminal Investigation and Case Preparation I, II, III		6		
	94.514, 94.515	Police Interrogation I, II	4		
	94.541, 94.542	Introduction to Criminalistics I, II	4		
	94.557	Investigative Report Writing	2		
94.577, 94.578, 94.579	Government Security Programs I, II, III		6		
	94.582	Document Control	2		
	94.583	Industrial Fire Prevention	2		
	94.584, 94.585	Plant Protection I, II	4		
	94.588	Retail Security	2	40	
				—	
Elective Courses*					10
					—
Total Credits					96

*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses from any other curricula in the University College Catalog.

SECURITY**Recommended Course Sequence for the 4-Year Program
Leading to the Associate in Science Degree**

	Quarter 1	Quarter 2	Quarter 3
1st Year	English I Admin. of Justice Criminal Law Police Patrol I	English II Plant Protec. I Evid. & Court Proc. I Police Patrol II	English III Plant Protec. II Evid. & Court Proc. II Ind. Fire Prev.
2nd Year	Soc. I Police Interrog. I Crim. Investig. & Case Prep. I Govt. Sec. Prog. I	Soc. II Police Interrog. II Crim. Investig. & Case Prep. II Govt. Sec. Prog. II	Soc. III Inv. Rep. Writ. Crim. Investig. & Case Prep. III Govt. Sec. Prog. III
3rd Year	Psych. I Mgmt. & Org. I Intro. to Crim. I E. D. P. I	Psych. II Mgmt. & Org. II Intro. to Crim. II E. D. P. II	Psych. III Mgmt. & Org. III Elective E. D. P. III
4th Year	Labor Mgmt. Rel. Human Rel. I Ind. Safety I Elective	Document Control Human Rel. II Ind. Safety II Elective	Sem. in Ind. Sec. Retail Sec. Ind. Psych. Elective

health-related programs

- forsyth school/northeastern university program for dental hygienists
- health care administration programs
- lincoln college/university college affiliated programs

FORSYTH/NORTHEASTERN UNIVERSITY PROGRAM FOR DENTAL HYGIENISTS

Bachelor of Science Degree

The Forsyth School for Dental Hygienists conducts a two-year day program of dental hygiene education and general education in cooperation with Northeastern University. Graduates of the program receive the Certificate in Dental Hygiene from Forsyth and the Associate in Science degree from University College. After receiving their Associate in Science degree, students may complete the remaining Liberal Arts courses required for the Bachelor of Science degree given by University College.

quarter hours

Associate in Science Degree

96

(Day program at Northeastern University and Forsyth School for Dental Hygienists)

Liberal Arts Courses

(Required through University College)

10.501,	10.502,	10.503	Mathematics I, II, III	6	
22.501,	22.502,	22.503	Principles of Political Science I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
23.504,	23.505,	23.506	U. S. History I, II, III	6	
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6	
30.507,	30.508,	30.509	Introduction to Literature I, II, III	6	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	
Fine Arts:			Art, Music, or Theatre Arts	6	
Literature:			English, American, or other in translation	6	54
				—	

Elective Courses*

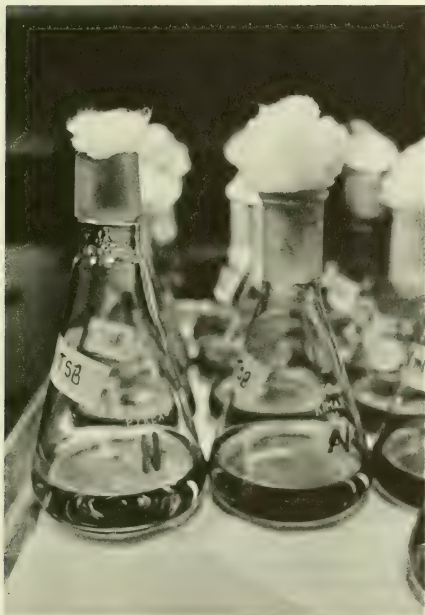
24

Total Credits

174

*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses in a variety of fields beyond the major.

health care administration



Aims

Programs in Health Care Administration are offered through University College in order to help mature students improve their educational preparation for advancement and service in hospitals and other health agencies through part-time study.

In addition to offering courses in the liberal arts and in business administration, specialized courses for particular categories of health personnel are offered when such offerings are justified in terms of community and student need. The unique resources of the Boston area as a medical center offer excellent support facilities for these health-related programs.

In addition to technically oriented courses for health specialists, a core of courses is offered which is designed to provide all health workers with a foundation for improved interdisciplinary cooperation and communication.

MANAGEMENT IN HEALTH AGENCIES AND INSTITUTIONS

Bachelor of Science Degree

quarter hours

Basic Courses—required

10.501,	10.502,	10.503	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
30.504,	30.505,	30.506	English I, II, III	6	
30.507,	30.508,	30.509	Introduction to Literature I, II, III	6	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	36
				—	

Core Courses—required

Liberal Arts

18.311,	18.312,	18.313	General Biology and Laboratory I, II, III	12	
18.324,	18.325,	18.326	Anatomy and Physiology I, II, III	6	
		19.532	Industrial Psychology	2	
21.501,	21.502,	21.503	Sociology I, II, III	6	
22.501,	22.502,	22.503	Principles of Political Science I, II, III	6	
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6	
Literature:			English, American, or other in translation	6	
Fine Arts:			Art, Music, or Theatre Arts	6	50
				—	

Management

39.511,	39.512,	39.513	Statistics I, II, III	6	
41.501,	41.502,	41.503	Accounting Principles I, II, III	6	
44.507,	44.508,	44.509	Corporate Finance I, II, III	6	
45.501,	45.502,	45.503	Management and Organization I, II, III	6	
	45.511,	45.512	Human Relations in Personnel I, II	4	
45.513,	45.514,	45.515	Personnel Management I, II, III	6	
		45.554	Business Conference Techniques	2	
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6	42
				—	

Health Care Administration

		86.502	Hospital Laws and Ethics	2	
86.504,	86.505,	86.506	Foundations of Medical Science I, II, III	6	
		86.507	Medical Terminology I	2	

In addition, each student will select one of the following sequences:

86.581,	86.582,	86.583	Hospital Organization and Management I, II, III—OR	}	6
86.571,	86.572,	86.573	Long-Term Care Administration I, II, III—OR		
	86.521,	86.522	Public Health I, II		
		86.511	Personal and Community Health		
					16

Elective Courses

Liberal Arts	6	
Management	6	
From Any Area	18	30
	—	
Total Credits		174

MANAGEMENT IN HEALTH AGENCIES AND INSTITUTIONS

Recommended Course Sequence for the 8-Year Program
Leading to the Bachelor of Science Degree

	Quarter 1	Quarter 2	Quarter 3
1st Year	English I Mgmt. & Org. I Math. I	English II Mgmt. & Org. II Math. II	English III Mgmt. & Org. III Math. III
2nd Year	West. Civ. I Gen. Biol. & Lab. I Acctg. I	West. Civ. II Gen. Biol. & Lab. II Acctg. II	West. Civ. III Gen. Biol. & Lab. III Acctg. III
3rd Year	Psych. I Anat. & Physiol. I Med. Termin. I	Psych. II Anat. & Physiol. II Bus. Conf. Tech.	Psych. III Anat. & Physiol. III Hosp. Law
4th Year	Lit. I Ind. Psych. Pers. Mgmt. I Found. Med. Sci. I	Lit. II Human Rel. I Pers. Mgmt. II Found. Med. Sci. II	Lit. III Human Rel. II Pers. Mgmt. III Found. Med. Sci. III
5th Year	Econ. I Fine Arts Mgmt. Elective Literature	Econ. II Fine Arts Mgmt. Elective Literature	Econ. III Fine Arts Mgmt. Elective Literature
6th Year	Soc. I Stat. I E. D. P. I L. A. Elective	Soc. II Stat. II E. D. P. II L. A. Elective	Soc. III Stat. III E. D. P. III L. A. Elective
7th Year	Pol. Sci. I Hosp. Org., Long- Term C., or Pub. Health I	Pol. Sci. II Hosp. Org., Long- Term C., or Pub. Health II	Pol. Sci. III Hosp. Org., Long- Term C. II, or Per.-Com. Health
	Elective	Elective	Elective
8th Year	Phil. I Elective Elective	Phil. II Elective Elective	Phil. III Elective Elective

NURSING HOME ADMINISTRATION

Recognizing the special needs of the nursing home administrator in a time of rapid change within our medical care system, University College has developed a progressive education plan in cooperation, and with the encouragement of, the Massachusetts Federation of Nursing Homes. Students within this program are considered to be candidates for the Bachelor of Science degree; however, in order to meet specific requirements for the professional and regulatory agencies, they may work toward an intermediate goal of a letter attesting to the completion of the following course sequence:

Required Courses:				quarter hours
19.501,	19.502,	19.503	Psychology I, II, III	6
		19.532	Industrial Psychology	2
	45.511,	45.512	Human Relations in Personnel I, II	4
45.501,	45.502,	45.503	Management and Organization I, II, III	6
41.501,	41.502,	41.503	Accounting Principles I, II, III	6
		86.502	Hospital Law and Ethics	2
86.504,	86.505,	86.506	Foundations of Medical Science I, II, III	6
		86.507	Medical Terminology I	2
86.571,	86.572,	86.573	Long-Term Care Administration I, II, III	6
Total Credits				40

It is understood that students who complete this sequence will ordinarily plan to complete the additional requirements for the Bachelor of Science degree in the Management in Health Agencies and Institutions curriculum (page 120). An additional optional goal would be to work toward the Associate in Science degree. Many of the credits in the above sequence would be applicable toward the associate degree. Students considering this latter course should consult an adviser.

Completion of this sequence of courses and possession of the letter documenting this fact does not constitute graduation from University College.

Through the Center for Continuing Education, Northeastern offers a unique series of week-long residential institutes for nursing home administrators, which do not carry academic credit. For information about this program, contact the Center for Continuing Education at the University.



MEDICAL RECORDS SCIENCE**Bachelor of Science Degree****Basic Courses—required**

quarter hours

10.501,	10.502,	10.503	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
30.504,	30.505,	30.506	English I, II, III	6	
30.507,	30.508,	30.509	Introduction to Literature I, II, III	6	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	36
				—	

Core Courses—required*Liberal Arts*

18.311,	18.312,	18.313	General Biology and Laboratory I, II, III	12	
18.324,	18.325,	18.326	Anatomy and Physiology I, II, III	6	
		19.532	Industrial Psychology	2	
21.501,	21.502,	21.503	Sociology I, II, III	6	
22.501,	22.502,	22.503	Principles of Political Science I, II, III	6	
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6	
Literature:			English, American, or other in translation	6	
Fine Arts:			Art, Music, or Theatre Arts	6	50
				—	

Management

39.511,	39.512,	39.513	Statistics I, II, III	6	
41.501,	41.502,	41.503	Accounting Principles I, II, III	6	
45.501,	45.502,	45.503	Management and Organization I, II, III	6	
	45.511,	45.512	Human Relations in Personnel I, II	4	
		45.554	Business Conference Techniques	2	
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6	30
				—	

Health Care Administration

		86.502	Hospital Law and Ethics	2	
86.504,	86.505,	86.506	Foundations of Medical Science I, II, III	6	
	86.507,	86.508	Medical Terminology I, II	4	12
				—	

Major Concentration Courses—required

86.551,	86.552,	86.553	Organization of the Medical Records Department I, II, III	6	
86.554,	86.555,	86.556	Medical Records Science I, II, III	12	
	86.557,	86.558	Medical Records Science IV, V	8	26
				—	

Elective Courses

Liberal Arts	6	
From Any Area	14	20
		—
Total Credits		174

(continued on following page)

In addition to completing the academic requirements, candidates for a degree with a major in Medical Records Science must also complete a minimum of 500 clock hours of supervised practice experience in affiliated hospitals. This experience is coordinated with the course work in the major field.

Candidates who wish to major in this program must be interviewed by the Assistant Director, Medical Records Science program. Arrangements for this interview may be made through the University College Office. No candidate will be considered as matriculated until this requirement has been met.

**Recommended Course Sequence for the 8-Year Program
Leading to the Bachelor of Science Degree in Medical Records Science**

	Quarter 1	Quarter 2	Quarter 3
1st Year	English I Mgmt. & Org. I Math. I	English II Mgmt. & Org. II Math. II	English III Mgmt. & Org. III Math. III
2nd Year	West. Civ. I Gen. Biol. & Lab. I	West. Civ. II Gen. Biol. & Lab. II	West. Civ. III Gen. Biol. & Lab. III
3rd Year	Acctg. I Psych. I Anat. & Physiol. I Med. Termin. I Lit. I	Acctg. II Psych. II Anat. & Physiol. II Med. Termin. II Lit. II	Acctg. III Psych. III Anat. & Physiol. III Hosp. Law Lit. III
4th Year	Literature Soc. I Ind. Psych. Found. Med. Sci. I	Literature Soc. II Human Rel. I Found. Med. Sci. II	Literature Soc. III Human Rel. II Found. Med. Sci. III
5th Year	Econ. I Fine Arts Med. Rec. Sci. I	Econ. II Fine Arts Med. Rec. Sci. II	Econ. III Fine Arts Med. Rec. Sci. III
6th Year	Stat. I Med. Rec. Sci. IV* Elective	Stat. II Med. Rec. Sci. V* Elective	Stat. III Bus. Conf. Tech. Elective Elective
7th Year	Pol. Sci. I Org. Med. Rec. I L. A. Elective	Pol. Sci. II Org. Med. Rec. II L. A. Elective	Pol. Sci. III Org. Med. Rec. III L. A. Elective Elective
8th Year	Phil. I E. D. P. I Elective	Phil. II E. D. P. II Elective	Phil. III E. D. P. III Elective

*Required clinical experience hours must be arranged in relation to courses starred.

MEDICAL RECORDS SCIENCE**Certification Program**

Candidates who wish to qualify for admission to the professional examination for registration as a record librarian (R.R.L.), and who already hold a bachelor's degree in another field from a college or university acceptable to Northeastern, may undertake the following course work. Successful completion of this course sequence with a cumulative quality point average of 2.00 will lead to certification from University College that the candidate has completed a professional program in Medical Records Science.

Courses required for Professional Certification:

				quarter hours
18.324,	18.325,	18.326	Anatomy and Physiology I, II, III	6
45.501,	45.502,	45.503	Management and Organization I, II, III	6
		86.502	Hospital Law and Ethics	2
86.504,	86.505,	86.506	Foundations of Medical Science I, II, III	6
	86.507,	86.508	Medical Terminology I, II	4
86.554,	86.555,	86.556	Medical Records Science I, II, III	12
	86.557,	86.558	Medical Records Science IV, V	8
86.551,	86.552,	86.553	Organization of the Medical Records Department I, II, III	6
			One course in Statistics	2
			One course in Principles of Electronic Data Processing	2
				—
Total Credits				54

In addition to completion of the academic requirements, candidates for certification must complete a minimum of 500 clock hours of supervised practice experience in affiliated hospitals. This experience is coordinated with the course work in the major field.

Candidates who wish to matriculate in this program must be interviewed by the Assistant Director, Medical Records Science program. Arrangements for this interview may be made through the University College Office. No candidate will be considered as matriculated until this requirement has been met.

MEDICAL RECORDS SCIENCE**Recommended Course Sequence for the 3-Year Program
Leading to a Certificate in Medical Records Science****(This program is open to candidates who hold an
acceptable baccalaureate degree only.)***Prerequisite:* A college-level course in General Biology

	Quarter 1	Quarter 2	Quarter 3
1st	Mgmt. & Org. I	Mgmt. & Org. II	Mgmt. & Org. III
Year	Anat. & Physiol. I	Anat. & Physiol. II	Anat. & Physiol. III
	Found. Med. Sci. I	Found. Med. Sci. II	Found. Med.
	Med. Termin. I	Med. Termin. II	Sci. III
2nd	Stat. I	E. D. P. I	
Year	Med. Rec. Sci. I	Med. Rec. Sci. II	Med. Rec. Sci. III
	Org. Med. Rec. I	Org. Med. Rec. II	Org. Med. Rec. III
3rd	*Med. Rec. Sci. IV	*Med. Rec. Sci. V	
Year			

*Required clinical experience hours must be arranged in relation to courses starred.

Hospitals Affiliated as Primary Teaching Units

Beth Israel Hospital, Boston
Children's Hospital Medical Center, Boston
Peter Bent Brigham Hospital, Boston
Public Health Service Hospital, Boston

Hospitals Affiliated for Supervised Practice

The Primary Teaching Units (above)
Boston Hospital for Women (Lying-In Div.), Boston
Mount Auburn Hospital, Cambridge
Nashoba Community Hospital, Ayer
Newton-Wellesley Hospital, Newton

Curriculum Advisory Committee in Medical Records Science

Regular Members

Joyce Gormley, R.R.L.
Massachusetts General Hospital, Boston

Marjorie Gurney, R.R.L.
Veterans Administration Hospital, W. Roxbury

Ruth Hayward, R.R.L.
Children's Hospital Medical Center, Boston

Lillian Liebich, R.R.L.
(President-elect, Massachusetts Association of
Medical Records Librarians)
North Adams Hospital, North Adams

Dorothy Richmond, R.R.L.
Beth Israel Hospital, Boston

Ex-Officio Members

Janice Gardner, R.R.L.
(President, Massachusetts Association of
Medical Records Librarians)
Nashoba Community Hospital, Ayer

Rina Zamczyk, R.R.L.
Curriculum Director, Program in Medical Records Science
Northeastern University

Edmund J. McTernan, M.S., M.P.H., F.S.P.H.A., F.A.C.H.A.
Program Director, Health Care Administration
Northeastern University

INHALATION THERAPY

As medical knowledge has advanced and become highly specialized, trained personnel in the fields related to medicine have become important members of the health care team. As a member of this team, Inhalation Therapists support and assist the physician toward the goal of optimum patient care by using many different treatments and rehabilitative procedures to help patients with respiratory problems. They work with such modern complex facilities as electronic respirators, ultrasonic nebulizers, blood gas machines, and pulmonary function equipment.

As physicians rely more and more on specialized techniques and equipment, the Inhalation Therapist is playing an increasingly important role in patient care.

The man or woman entering this field now is joining a rapidly expanding specialty and can expect to grow with the field. The demand for skilled registered Inhalation Therapists is high, and opportunities are unlimited throughout the world.

The program consists of 96 quarter hours of course work and a minimum of 500 clock hours of clinical instruction and practice. The clinical program is conducted at the following medical facilities:

Beth Israel Hospital
Children's Hospital Medical Center
Massachusetts General Hospital
Peter Bent Brigham Hospital

Medical Advisory Committee

Leonard Bushnell, M.D., Beth Israel Hospital
Dean S. Crocker, M.D., Children's Hospital Medical Center
John Hedley-Whyte, M.D., Beth Israel Hospital
Ellison C. Pierce, M.D., Peter Bent Brigham Hospital
Henning Pontoppidan, M.D., Massachusetts General Hospital

Ex Officio:

Dean S. Crocker, M.D., Medical Consultant
Jimmy A. Young, A.R.I.T., Technical Director
Edmund J. McTernan, M.P.H., Program Director

Registration in this program requires an interview by, and permission of the Program Director.

Registration is limited by the availability of clinical experience, and by the faculty-student ratios recommended by the certifying organizations. In the interest of patient welfare, preference will be given to persons now employed in Inhalation Therapy departments of hospitals if applications exceed capacity. Registration in 86.591, the first professional course in this program, is by permission of the Program Director only.

INHALATION THERAPY**Associate in Science Degree****Basic Courses—required**

				quarter	hours
10.501,	10.502,	10.503	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
30.504,	30.505,	30.506	English I, II, III	6	
30.507,	30.508,	30.509	Introduction to Literature I, II, III	6	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, II	6	36

Core Courses—required

18.304,	18.305,	18.306	Integrated Science I, II, III	12	
19.541,	19.542,	19.543	Abnormal Psychology I, II, III	6	
21.501,	21.502,	21.503	Sociology I, II, III	6	
		29.501	Effective Speaking I	2	
		86.502	Hospital Law and Ethics	2	
86.504,	86.505,	86.506	Foundations of Medical Science I, II, III	6	
		86.503	Emergency Procedures and Accident Prevention	2	42

Major Concentration Courses—required

		86.589	Basic Nursing for Health Technicians (nc)		
86.591,	86.592,	86.593	Introduction to Inhalation Therapy I, II, III	6	
86.594,	86.595,	86.596	*Procedures in Inhalation Therapy I, II, III	9	
86.597,	86.598	86.599	*Procedures in Inhalation Therapy IV, V, VI	9	24
Total Credits				<u>9</u>	<u>96</u>

*In order to qualify for the degree, and to meet the requirements for registration of the American Registry of Inhalation Therapists, a minimum of 500 clock hours of supervised clinical practice must be completed. This experience must be obtained as assigned in two or more of the hospitals affiliated with this program.

INHALATION THERAPY

**Recommended Course Sequence for the 4-Year Program
Leading to the Associate in Science Degree**

	Quarter 1	Quarter 2	Quarter 3
1st Year	English I Integ. Sci. I Intro. Inh. Ther. I	English II Integ. Sci. II Intro. Inh. Ther. II	English III Integ. Sci. III Intro. Inh. Ther. III
Summer Session—Basic Nursing for Health Technicians			
2nd Year	West. Civ. I Lit. I Found. Med. Sci. I *Proc. Inh. Ther. I	West. Civ. II Lit. II Found. Med. Sci. II *Proc. Inh. Ther. II	West. Civ. III Lit. III Found. Med. Sci. III *Proc. Inh. Ther. III
3rd Year	Psych. I Hosp. Law *Proc. Inh. Ther. IV	Psych. II Emerg. Proc. *Proc. Inh. Ther. V	Psych. III Meth. Health Ed. *Proc. Inh. Ther. VI
4th Year	Math. I Soc. I Econ. I Abnorm. Psych. I Eff. Spkg.	Math. II Soc. II Econ. II Abnorm. Psych. II	Math. III Soc. III Econ. III Abnorm. Psych. III



*Required clinical experience hours must be arranged in relation to courses starred.



lincoln college/university college

affiliated programs

Science Technology Related Program

The Chemical-Biological Technology program is an interdisciplinary program integrating theoretical and laboratory course sequences from the fields of chemistry and biology which prepare the student to assume responsibilities in laboratory careers which emphasize laboratory applications and teaching careers in general science. Employment opportunities are in a wide variety of industrial, pharmaceutical, clinical, and hospital laboratories dealing with analytical, production, and research functions and in secondary school education in the teaching of general science, chemistry, biology, and other related subjects. The Chemical-Biological Technology program leads to the Bachelor of Science degree from University College.

Allied-Medical Technology Related Programs

A program in Cytotechnology is offered through the cooperating efforts of Lincoln College and University College and conducted in affiliation with the several hospitals which comprise the Boston School of Cytotechnology. The program leads to the Bachelor of Science degree, which is awarded by University College, and certification of registration by the American Society of Clinical Pathologists.

Cytotechnology is a specialty in the broader field of medical technology. Cytotechnologists are employed in pathology laboratories, where they expertly examine slides of cells looking for minute abnormalities which are the early warning signs of cancer and related disease. Cytotechnology occupies a highly important place in clinical medicine requiring a technician with not only highly specialized laboratory training but a sound academic background.

The program in Medical Technology is a joint Lincoln College—University College program which is conducted in affiliation with several hospital schools of medical technology approved by the American Medical Association. The program leads to the Bachelor of Science degree, which is awarded by University College, and entitles the student to take the registration examination of the American Society of Clinical Pathologists.

The medical technologist is a most respected and important member of the paramedical team. He works as a professional in close association with pathologists, doctors and hospital and medical laboratory personnel. Performing in a variety of specialized fields such as bacteriology, histology, biochemistry, and nuclear and radiochemistry, the medical technologist performs chemical tests, and morphologically and biochemically identifies bacteria. He makes important observations necessary for critical diagnosis by the doctor for early detection and treatment of diseases.

CHEMICAL-BIOLOGICAL TECHNOLOGY**Bachelor of Science Degree**

Prerequisite: Satisfactory completion of the Mathematics Placement Test or Introductory Mathematics I and II (10.301, 10.302).

FIRST YEAR

Course Number		Course	Q.H.
10.311,	10.312	Algebra I, II	4
10.313,	10.314	Trigonometry I, II	4
	10.315	Introduction to Calculus	4
12.314,	12.315,	12.316	General Chemistry and Laboratory I, II, III
30.504,	30.505,	30.506	English I, II, III

SECOND YEAR

10.321,	10.322,	10.323	Calculus I, II, III	}	6
			or		
39.511,	39.512,	39.513	Statistics I, II, III		
12.321,	12.322,	12.323	Analytical Chemistry I, II, III		6
12.324,	12.325,	12.326	Analytical Chemistry Laboratory I, II, III		6
23.501,	23.502,	23.503	Western Civilization I, II, III		6

THIRD YEAR

11.304,	11.305,	11.306	General Physics I, II, III	6
18.311,	18.312,	18.313	General Biology and Laboratory I, II, III	12
30.507,	30.508,	30.509	Introduction to Literature I, II, III	6

FOURTH YEAR

12.331,	12.332,	12.333	Organic Chemistry I, II, III	6
12.334,	12.335,	12.336	Organic Chemistry Laboratory I, II, III	6
18.314,	18.315,	18.316	Botany I, II, III	9
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6

FIFTH YEAR

12.351,	12.352,	12.353	Instrumental and Radio-Chemistry I, II, III	6
18.321,	18.322,	18.323	Microbiology and Laboratory I, II, III	12
			*Elective	6

SIXTH YEAR

18.324,	18.325,	18.326	Anatomy and Physiology I, II, III	6
18.351,	18.352,	18.353	Histology-Organology I, II, III	6
21.501,	21.502,	21.503	Sociology I, II, III	6
			*Elective	6

SEVENTH YEAR

16.531,	16.532,	16.533	Oceanography I, II, and Marine Geology	6
18.357,	18.358,	18.359	Genetics I, II, III	6
19.501,	19.502,	19.503	Psychology I, II, III	6
			*Elective	6

*General Science Teacher Option—Students planning to apply to the Northeastern University Graduate School of Education must include courses in Adolescent Psychology and Principles of Teaching among the electives.

CYTOTECHNOLOGY**Bachelor of Science Degree**

Prerequisite: Satisfactory completion of the Mathematics Placement Test or Introductory Mathematics I and II (10.301, 10.302).

FIRST YEAR			
Course Number	Course		Q.H.
10.311, 10.313,	10.312	Algebra I, II	4
	10.314	Trigonometry I, II	4
	10.315	Introduction to Calculus	4
12.314, 12.315,	12.316	General Chemistry and Laboratory I, II, III	9
30.504, 30.505,	30.506	English I, II, III	6
SECOND YEAR			
10.321, 10.322,	10.323	Calculus I, II, III	6
	or	Statistics I, II, III	
39.511, 39.512,	39.513	General Biology and Laboratory I, II, III	12
18.311, 18.312,	18.313	Economic Principles and Problems I, II, III	6
39.501, 39.502,	39.503		
THIRD YEAR			
11.304, 11.305,	11.306	General Physics I, II, III	6
12.331, 12.332,	12.333	Organic Chemistry I, II, III	6
12.334, 12.335,	12.336	Organic Chemistry Laboratory I, II, III	6
19.501, 19.502,	19.503	Psychology I, II, III	6
FOURTH YEAR			
12.321, 12.322,	12.323	Analytical Chemistry I, II, III	6
12.324, 12.325,	12.326	Analytical Chemistry Laboratory I, II, III	6
18.324, 18.325,	18.326	Anatomy and Physiology I, II, III	6
23.501, 23.502,	23.503	Western Civilization I, II, III	6
FIFTH YEAR			
18.351, 18.352,	18.353	Histology-Organology I, II, III	6
	86.502	Hospital Law and Ethics	6
	86.507	Medical Terminology I	
	18.391	Photomicroscopy	
	or	Foundations of Medical Science I, II, III	
86.504, 86.505,	86.506		
6 Months' AMA-approved Hospital School of Cytotechnology and 6 Months' Internship—(Student will take Registry Examination at the end of hospital training period before academic credit for hospital school phase is officially granted.)			15
SIXTH YEAR			
18.321, 18.322,	18.323	Microbiology and Laboratory I, II, III	12
18.341, 18.342,	18.343	Hematology I, II, III	6
		Elective (Non-Science)	6
SEVENTH YEAR			
17.311, 17.312,	17.313	Clinical Biochemistry I, II, III	6
30.507, 30.508,	30.509	Introduction to Literature I, II, III	6
		Elective (Non-Science)	6
		Elective	6

MEDICAL TECHNOLOGY**Bachelor of Science Degree**

Prerequisite: Satisfactory completion of the Mathematics Placement Test or Introductory Mathematics I and II (10.301, 10.302).

FIRST YEAR

Course Number	Course	Q.H.
10.311, 10.312	Algebra I, II	4
10.313, 10.314	Trigonometry I, II	4
	10.315 Introduction to Calculus	4
12.314, 12.315, 12.316	General Chemistry and Laboratory I, II, III	9
30.504, 30.505, 30.506	English I, II, III	6

SECOND YEAR

10.321, 10.322, 10.323	Calculus I, II, III	}	6
	or		
39.511, 39.512, 39.513	Statistics I, II, III		
12.321, 12.322, 12.323	Analytical Chemistry I, II, III		6
12.324, 12.325, 12.326	Analytical Chemistry Laboratory I, II, III		6
39.501, 39.502, 39.503	Economic Principles and Problems I, II, III		6

THIRD YEAR

12.331, 12.332, 12.333	Organic Chemistry I, II, III	6
12.334, 12.335, 12.336	Organic Chemistry Laboratory I, II, III	6
18.311, 18.312, 18.313	General Biology and Laboratory I, II, III	12

FOURTH YEAR

11.304, 11.305, 11.306	General Physics I, II, III	6
18.321, 18.322, 18.323	Microbiology and Laboratory I, II, III	12
23.501, 23.502, 23.503	Western Civilization I, II, III	6

FIFTH YEAR

12.351, 12.352, 12.353	Instrumental and Radiochemistry I, II, III	6
30.507, 30.508, 30.509	Introduction to Literature I, II, III	6
73.311, 73.312, 73.313	Clinical Biochemistry	6
	*Elective	6

SIXTH YEAR

12 Months' Internship at an A.M.A.-approved Hospital School of Medical Technology	30
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SEVENTH YEAR

18.341, 18.342, 18.343	Hematology I, II, III	6
19.501, 19.502, 19.503	Psychology I, II, III	6
	*Elective (Non-Science)	6
	*Elective (Science)	6

*Before registering for any electives, students should submit a proposed program of elective courses—preferably representing a minor field of concentration consistent with his personal career objectives—for approval by the Committee on Education.

course descriptions

Abbreviations

Q. H. = Quarter Hours (credit earned)

Cl. = Hours required in class per week

Prereq. = Prerequisite

10—MATHEMATICS

Students intending to enroll in Mathematics I (10.501) will be given a Mathematics Placement Test during the registration period. A satisfactory score in this test will entitle the student to enroll in course 10.501, while an unsatisfactory score will require that he enroll in the non-credit course 10.301 for additional preparation.

10.301 Introduction to Mathematics I Prereq. none; 4 Cl.; non-credit
A comprehensive review of high school algebra, including: first-degree equations, factoring, fractional equations, work problems, and concepts of plane geometry.

10.302 Introduction to Mathematics II Prereq. 10.301; 4 Cl.; non-credit
Algebraic operations with fractions and mixed expressions, proportions, square roots, radicals, quadratics; simultaneous equations, graphs, and fractional exponents. The geometry of the right triangle, areas of polygons, circles, and loci problems. Basic slide rule operation.

10.501, 10.502, 10.503 Mathematics I, II, III
Prereq. Math Placement Test or 10.302; 2 Cl.; 6 Q. H.
Methods and applications of algebra; graphical techniques; exponents and logarithms; review of geometry; basic trigonometry; introduction to statistics and probability.

10.504, 10.505, 10.506 Mathematics for Business Management I, II, III
Prereq. 10.503; 2 Cl.; 6 Q. H.
Concepts of mathematics underlying operations research, emphasizing applications to business management. Logic, set theory, probability and risk in decision-making, elementary vector and matrix algebra, mathematics of finance, linear programming, game theory.

10.316 Probability and Statistics I Prereq. 10.503; 2 Cl.; 2 Q. H.
Basic tools, e.g., sets, permutations and combinations; probability and applications.

10.317 Probability and Statistics II Prereq. 10.316; 2 Cl.; 2 Q. H.
Descriptive statistics; frequency distributions and probability density functions; normal and other distributions.

- 10.318 Probability and Statistics III** Prereq. 10.317; 2 Cl.; 2 Q. H.
Bivariate distributions; correlation; statistical inference and estimation; regression.
- 10.320 Calculus I** Prereq. 10.503; 4 Cl.; 4 Q. H.
Functions, graphs and limits; differentiation and integration of algebraic functions, with applications; study of circles and analysis of the straight line and conic sections.
- 10.321 Calculus II** Prereq. 10.320; 2 Cl.; 2 Q. H.
Calculus of non-algebraic functions, trigonometric and inverse trigonometric, logarithmic, exponential, hyperbolic.
- 10.322 Calculus III** Prereq. 10.321; 2 Cl.; 2 Q. H.
Differentials; the Law of the Mean, and indeterminate forms; techniques of integration; the definite integral and the fundamental theorem, and application to volume and surface area of revolution and to length of arc of a curve.
- 10.323 Calculus IV** Prereq. 10.322; 2 Cl.; 2 Q. H.
Infinite series; partial differentiation; multiple integrals.
- 10.324 Differential Equations I** Prereq. 10.323; 2 Cl.; 2 Q. H.
Vector analysis; matrices and linear algebra.
- 10.325 Differential Equations II** Prereq. 10.324; 2 Cl.; 2 Q. H.
Ordinary differential equations—standard types of the first order; linear differential equations, especially with constant coefficients. Laplace transforms.
- 10.326 Differential Equations III** Prereq. 10.325; 2 Cl.; 2 Q. H.
Series solutions of differential equations; Fourier series and orthogonal functions.
- 10.351 Advanced Mathematics I (Numerical Analysis)**
Prereq. 45.575 and 10.326; 2 Cl.; 2 Q. H.
Basic methods of numerical analysis—roots by iteration; approximating polynomials and interpolation; least squares fitting; numerical integration; approximate solution of ordinary differential equations—problems employing the electronic computer.
- 10.352 Advanced Mathematics II** Prereq. 10.351; 2 Cl.; 2 Q. H.
Introduction to partial differential equations; boundary-value problems; Sturm-Liouville systems.
- 10.353 Advanced Mathematics III** Prereq. 10.352; 2 Cl.; 2 Q. H.
Special topics in analysis.
- 10.361 Modern Algebra I** Prereq. 10.503; 2 Cl.; 2 Q. H.
The integers; rational and real numbers; mathematical induction; polynomials.

10.362 Modern Algebra II

Prereq. 10.361; 2 Cl.; 2 Q. H.

The complex field; equivalence relations; groups; subgroups.

10.363 Modern Algebra III

Prereq. 10.362; 2 Cl.; 2 Q. H.

Vector spaces; linear independence; linear algebra and transformations.

11—PHYSICS**11.301 Introductory Physics I**

Prereq. none; 2 Cl.; non-credit

A survey of physical principles and theories related to field of mechanics. A relatively non-mathematical approach is used.

11.302 Introductory Physics II

Prereq. none; 2 Cl.; non-credit

Extension of principles in mechanics and introduction of concepts in electricity and magnetism.

***11.304 General Physics I**

Prereq. 10.501, 10.502 and

10.503 or concurrently; 2 Cl.; 2 Q. H.

Survey of Newtonian mechanics; kinematics and dynamics of particle motion; projectile and circular motion; rotational motion; conservation laws of energy and momentum.

11.305 General Physics II

Prereq. 11.304; 2 Cl., 2 Q. H.

Temperature; heat energy; mechanical equivalent of heat; wave motion; sound; Doppler's effect; properties of light; simple optical systems.

11.306 General Physics III

Prereq. 11.305; 2 Cl.; 2 Q. H.

Fundamentals of electricity and magnetism; fields; potential; electric current; inductance; capacitance; electromagnetism; a-c and d-c series circuits.

12—CHEMISTRY**12.301 Introductory Chemistry I**

Prereq. none; 2 Cl.; non-credit

A non-mathematical approach to the concepts of chemistry including matter, elements and compounds, chemical bonding, chemical equations.

12.302 Introductory Chemistry II

Prereq. 12.301; 2 Cl.; non-credit

A continuation of 12.301, including Periodic System, forms of energy, oxidation-reduction, solutions, chemical and ionic equilibrium, nuclear reactions, and a brief introduction to organic chemistry.

12.311 General Chemistry I

Prereq. none; 2 Cl.; 2 Q. H.

Fundamental ideas of matter and energy; properties of gases, liquids and solids; atomic structure; chemical bonding and valence; classification of the elements; acids and bases; solutions of non-electrolytes; solutions of electrolytes; chemical equilibrium.

12.312 General Chemistry II

Prereq. 12.311; 2 Cl.; 2 Q. H.

Ionic reactions and ionic equilibrium; oxidation-reduction reactions; electrochemistry; chemical kinetics; colloidal dispersions; nuclear chemistry; chemistry of metals and non-metals; study of families of elements in the Periodic System.

12.313 General Chemistry III

Prereq. 12.312; 2 Cl.; 2 Q. H.

Chemistry of related and similar metals; coordination compounds; chemistry of organic compounds, both open and closed-chain compounds; organic chemistry of natural and synthetic products, including petroleum, rubber, synthetic resins, plastics, etc.

16—NATURAL SCIENCE

16.501, 16.502, 16.503 Natural Science I, II, III

6 Q. H.

The universe and the solar system; the earth from an astronomical, geological, and meteorological viewpoint; the nature of matter and energy. The elements of physics and chemistry and their applications to everyday life; the basic theory of atomic energy; the more recent developments in atomic research. A brief review of the history of biology precedes a study of the cell and the essential life processes. Examples of the plant and animal kingdoms, with particular emphasis on those organisms which have a direct effect on man; the flowering plants, ecology, and conservation. The various human systems, with emphasis on physiology rather than anatomy; contributions of medicine; genetics and evolution.

16.511, 16.512, 16.513 History of Science and Technology I, II, III

Prereq. 16.503 or equiv.; 6 Q. H.

An analysis of the varieties of cultures and civilizations from primitive man to the present. Particular emphasis on the inter-relationships of science, technology, and society. Classes will incorporate an independent study-seminar technique, drawing upon the training, experience, and interest of each student. The first term will cover primitive man to the Roman Empire; the second, the Roman Empire to Sir Isaac Newton; and the third, Sir Isaac Newton to the present.

16.521 Introduction to Geology

Prereq. 16.503 or equiv.; 2 Q. H.

Introduction to fundamental concepts of the earth and its crust. Consideration of the nature and properties of the materials composing the earth; the areal distribution of these materials, and the processes by which they are formed, altered, transported, and deposited; and the nature and development of the landscape.

16.522 Economic Mineralogy

Prereq. 16.503 or equiv.; 2 Q. H.

Introduction to the geological occurrence, mineralogy, use, and economics of the more important metallic and non-metallic minerals in the world today. International mineral problems will be discussed.

16.523 Gemology

Prereq. 16.503 or equiv.; 2 Q. H.

Introduction to the precious and semiprecious minerals of the earth's crust. Techniques of gem cutting, polishing, and faceting will be discussed in detail. Opportunity will be available to view and handle actual gem stones.

- 16.531 Oceanography I** Prereq. 16.503 or equiv.; 2 Q. H.
An introduction to the geology of the ocean basins and the physical and chemical properties of sea water. The development of ocean currents and their effect on the land masses of the world.
- 16.532 Oceanography II** Prereq. 16.531; 2 Q. H.
The habitat zones and organisms of the sea. Phytoplankton, zooplankton, and nekton are discussed. The growing economic importance of marine resources for the expanding world population.
- 16.533 Marine Geology** Prereq. 16.503 or equiv.; 2 Q. H.
Physiography and structure of ocean basins. Marine geological processes and features including sedimentation, erosion, shorelines, and bottom topography. Methods and techniques of marine geological exploration.
- 16.534 Fisheries Oceanography I** Prereq. 16.503 or equiv.; 2 Q. H.
Survey of commercially important marine organisms. An introduction to life histories and distribution of commercially important seaweed, shellfish, and fishes. Population dynamics and fishery potential of the world's oceans. An analysis of fishery stocks and sea farming.
- 16.535 Fisheries Oceanography II** Prereq. 16.534; 2 Q. H.
Commercial fishing methods, techniques, and equipment. Methods of harvesting the seas from past to present. An analysis of the various fisheries of the Atlantic Ocean with their equipment. Latest techniques of electric and photic fish capture.
- 16.536 Fisheries Oceanography III** Prereq. 16.535; 2 Q. H.
Commercial fishery products and their exploitation. A study of the commercial products and applications of marine organisms such as sea weed, fish, and shellfish. Particular emphasis on the marine products of commerce from the New England area. Chemical, industrial, and dietary applications of marine products.
- 16.541 Meteorology I** Prereq. 16.503 or equiv.; 2 Q. H.
Introduction to the structure, composition and phenomena of the atmosphere. Consideration of solar radiation, aurora, airglow, meteors and radio propagation in the upper atmosphere, followed by a detailed examination of the major weather elements, related measuring instruments and global wind circulation of the troposphere. Laboratory exercises include plotting horizontal and vertical variations in temperature, pressure and moisture, with analysis of the dynamic inter-relationships involved.
- 16.542 Meteorology II** Prereq. 16.541; 2 Q. H.
Study of secondary wind circulation, air masses, frontal systems, thunderstorms, hurricanes and tornadoes. Techniques in local short-range and regional long-range forecasting, with special attention to New England conditions. Laboratory exercises in synoptic weather maps preparation, analysis and interpretation.
- 16.543 Climatology** Prereq. 16.503 or equiv.; 2 Q. H.
Classification, analysis and geographic distribution of climatic types. Consideration of microclimates and relationship of weather and climatic elements

to other factors in the natural environment and human activities. Opportunity provided to apply effects of these elements to a chosen area of personal interest.

16.551 Astronomy I

Prereq. 16.503 or equiv.; 2 Q. H.

Direction, orientation, and division of space and time. The six main types of bodies of the Solar System in terms of their observed properties and motions.

16.552 Astronomy II

Prereq. 16.551; 2 Q. H.

Light as part of the electromagnetic spectrum and as a fundamental basis of man's observations. A survey of light and radio telescopes, spectroscopes, and other tools of astronomy. The sun as a typical star.

16.553 Astronomy III

Prereq. 16.552; 2 Q. H.

Stellar classification, variety, and evolution as fundamentals in the understanding of clusters, galaxies, and cosmology.

16.561 Physical Geography I

Prereq. 16.503 or equiv.; 2 Q. H.

The physical assessment of the earth as a globe; relations with the sun, geographic grid, map projections, illumination of the globe, geographic time studies, and moon-tide relationships.

16.562 Physical Geography II

Prereq. 16.561; 2 Q. H.

The physical weather elements of air temperature, pressure, moisture, and cyclonic storms; role of these elements in world climate.

16.563 Physical Geography III

Prereq. 16.503 or equiv.; 2 Q. H.

The earth's landforms; their formation and description. Landforms to be studied will include those formed by streams, glaciers, waves, and volcanoes.

16.571 Conservation of Natural Resources I Prereq. 16.503 or equiv.; 2 Q. H.

The philosophy of conservation. Historical development of the Conservation Movement in the U.S. since 1900. Interactions of economics and conservation.

16.572 Conservation of Natural Resources II

Prereq. 16.571; 2 Q. H.

Problems relating to the supply, use, and management of major renewable natural resources such as forests, soil, wildlife, and water.

16.573 Conservation of Natural Resources III

Prereq. 16.572; 2 Q. H.

Application of the theories and techniques of conservation to problems of urban resources, air and water pollution, recreational resources, and the availability of funds.

18—BIOLOGY

- 18.304 Integrated Science I** 2 Cl.; 4 Lab.; 4 Q. H.
Principles of chemistry; principles of biology.
- 18.305 Integrated Science II** Prereq. 18.304; 2 Cl.; 4 Lab.; 4 Q. H.
Introduction to essential concepts in the major areas of biology; physico-chemical background of biology.
- 18.306 Integrated Science III** Prereq. 18.305; 2 Cl.; 4 Lab.; 4 Q. H.
Human anatomy and physiology.
- 18.311 General Biology and Laboratory I** Prereq. none; 3 Cl.; 4 Lab.; 4 Q. H.
Fundamental concepts of the physical, chemical, and biological characteristics and behavior of protoplasm and cells. Plant and animal metabolism.
- 18.312 General Biology and Laboratory II** Prereq. 18.311; 3 Cl.; 3 Lab.; 4 Q. H.
Maintenance of internal environment, gametogenesis and cell division, plant life history, invertebrate and vertebrate anatomy.
- 18.313 General Biology and Laboratory III** Prereq. 18.312; 3 Cl.; 3 Lab.; 4 Q. H.
Fundamentals of genetics and eugenics; embryology; ecology.
- 18.314 Botany I** Prereq. 18.313; 2 Cl.; 2 Q. H.
The plant cell, tissues, and parts of flowering plants.
- 18.315 Botany II** Prereq. 18.314; 2 Cl.; 2 Q. H.
Classification of the plant kingdom, plantal life histories.
- 18.316 Botany III** Prereq. 18.315; 2 Cl.; 2 Q. H.
Physiology and life activities of plants.
- 18.321 Microbiology I** Prereq. 18.313; 2 Cl.; 4 Lab.; 4 Q. H.
Biology of bacteria and other microorganisms, preparation of media, sterilization, staining, isolation, and identification of pure cultures.
- 18.322 Microbiology II** Prereq. 18.321; 2 Cl.; 4 Lab.; 4 Q. H.
Bacteriology of water, sewage, air, and milk. Standards, plate counts, and physiological tests.
- 18.323 Microbiology III** Prereq. 18.322; 2 Cl.; 4 Lab.; 4 Q. H.
Survey of pathogenic microorganisms; metabolic activities.
- 18.324 Human Anatomy and Physiology I** Prereq. 18.306 or 18.313; 1 Cl.; 3 Lab.; 2 Q. H.
The structure and function of vertebrate organ systems.

18.325 Human Anatomy and Physiology II

Prereq. 18.324; 1 Cl.; 3 Lab.; 2 Q. H.

Introduction to cellular metabolism.

18.326 Human Anatomy and Physiology III

Prereq. 18.325; 1 Cl.; 3 Lab.; 2 Q. H.

Continuation of the study of cellular metabolism.

18.357 Genetics I

Prereq. 18.313; 2 Cl.; 2 Q. H.

Mitosis, meiosis, and mendelian genetics.

18.358 Genetics II

Prereq. 18.357; 2 Cl.; 2 Q. H.

Chromosome mapping, mutations, translocation, chromosomal aberrations.

18.359 Genetics III

Prereq. 18.358; 2 Cl.; 2 Q. H.

Population genetics, aspects of biochemical genetics.

19—PSYCHOLOGY

19.501, 19.502, 19.503 Psychology I, II, III

6 Q. H.

An introductory survey of the general field of psychology. The first term covers historical backgrounds of psychology, psychological measurement and testing, personality, behavior disorders, and psychotherapy; the second term, maturation and development, principles of animal and human learning, memory, thought, language, motivation, and emotion; the third term, sensory processes, perception, social psychology, and psychology in industry.

19.504, 19.505, 19.506 Statistics in Psychology I, II, III

Prereq. 19.503; 6 Q. H.

Scales of measurement, graphs, measures of central tendency, variability, and correlation. Probability, statistical distributions, and parametric and non-parametric tests of significance, including chi square, t-test, F test and simple analysis of variance.

NOTE: May not be taken in addition to Statistics (39.511, 39.512, 39.513), which may be substituted.

19.511, 19.512, 19.513 Child and Adolescent Psychology I, II, III

Prereq. 19.503; 6 Q. H.

Detailed exploration of the processes of growth and development from infancy through adolescence. Consideration of such topics as sensory and motor development, social development and peer group relations, intelligence, language, thought, and personality.

19.521 Personality I

Prereq. 19.503; 2 Q. H.

Systematic study of the normal personality. A number of prominent theoretical approaches to personality will be considered including the psychoanalytic, constitutional, field and stimulus-response.

19.522 Personality II

Prereq. 19.521; 2 Q. H.

Problems of adjustment, frustration, conflict, and stress. Adjustive behavior, mechanisms of defense, and minor personality maladjustments will be considered.

19.523 Motivation

Prereq. 19.522; 2 Q. H.

Survey of the various aspects of motivation. Such areas as primary and secondary reinforcement, unconscious motivation, effectance motivation, and the assessment of motive will be considered.

19.524, 19.525 Social Psychology I, II

Prereq. 19.503; 4 Q. H.

An analysis of the behavior of the individual in social contexts. Topics considered include the nature and measurement of attitudes, language and communication, group membership and structure, leadership, crowd behavior, and social movements.

19.531 Psychological Testing

Prereq. 19.506; 2 Q. H.

Basic principles of test theory, test administration, and test construction. Familiarization with representative types of tests.

19.532 Introduction to Industrial Psychology

Prereq. 19.503; 2 Q. H.

Psychological techniques in the selection and placement of employees; use of psychological tests in industry; and the evaluation of the human factors leading to optimal working efficiency and job satisfaction.

19.541, 19.542, 19.543 Abnormal Psychology I, II, III

Prereq. 19.503; 6 Q. H.

Study of the abnormal personality, etiology, dynamics, and symptomatology of the neuroses and psychoses; psychosomatic, psychopathic, and organic disorders; psychotherapy.

19.551, 19.552, 19.553 Experimental Psychology I, II, III

Prereq. 19.506; 2 Cl.; 2 Lab.; 9 Q. H.

The methods and techniques for the design, execution, and interpretation of psychological experiments. Laboratory instrumentation and research methodology in the investigation of the sensory processes, perceptual-motor behavior, motivation and learning.

19.561, 19.562, 19.563 Historical Development of**Psychology I, II, III**

Prereq. two full-year courses in Psychology; 6 Q. H.

The historical development of psychology from its philosophical beginnings to the twentieth century. Major schools of psychology which have influenced the development of modern psychology including structuralism, functionalism, behaviorism, Gestalt psychology, and psychoanalysis. The role of theory in current psychological research.

19.571 Seminar in Psychology

Prereq. 19.553; 2 Q. H.

Discussion of current problems in psychology.

20—ANTHROPOLOGY

- 20.501 Introduction to Physical Anthropology** Prereq. 21.503; 2 Q. H.
An introduction to elements of physical anthropology, covering such subjects as the primates, fossil man and evolution, problems of heredity and genetics, and problems of race and racial classification.
- 20.502, 20.503 Cultural Anthropology I, II** Prereq. 20.501; 2 Q. H.
An intensive introduction to cultural anthropology covering the nature of culture, methods and theories, characteristic features of the language, family life, rituals, and values of tribal peoples in different parts of the world.
- 20.521 Culture and Personality** Prereq. 20.503; 2 Q. H.
A cultural approach integrating concepts of social role, values, personality and socialization, and linguistic considerations.
- 20.531 Primitive Social Organization** Prereq. 20.503; 2 Q. H.
The institutions of primitive societies; comparative approaches and functional explanations of a limited number of societies; the dynamics of continuity and change of culture and social organization.
- 20.532 Primitive Religion** Prereq. 20.503; 2 Q. H.
A study of religious beliefs and rituals of tribal peoples in many parts of the world, including the origin of religious behavior, the relationship of religious behavior to other aspects of culture, and the psychological factors involved.
- 20.533 Acculturation** Prereq. 20.503; 2 Q. H.
An examination of the processes of acculturation in culture contact situations of tribal and non-tribal peoples. Focus is on the role of the individual, and the concepts of personality and values in relation to this process.
- 20.537 Anthropological Theory** Prereq. 20.503; 2 Q. H.
A history of major orientations, emphasizing the principal contemporary orientations in the field. Evolutionary approaches, culture area and historical analysis, functionalism, role structure, comparative methods, social relations approaches, and the theory of cognitive structure.
- 20.541 North American Indian** Prereq. 20.503; 2 Q. H.
Prehistory of the North American Indian, including the study of aboriginal culture areas, utilizing a comparative analysis of representative Indian tribes and their cultures as the method of study. Family life, religion, warfare patterns, and political organization are described.
- 20.544 African Peoples and Cultures** Prereq. 20.503; 2 Q. H.
African geography, prehistory and cultures; the spectrum of cultures ranging from the Pygmy to the Ashanti Federation; the family, lineage, clan and tribe as these relate to problems of political and economic change in contemporary Africa.
- 20.547 Latin American Peoples and Cultures** Prereq. 20.503; 2 Q. H.
Tribal social systems, traditional values, and institutions of Latin America with particular emphasis on Hispanic America.

21—SOCIOLOGY

21.501, 21.502, 21.503 Sociology I, II, III Prerequisite to all other Sociology courses. Prereq. 30.506; 6 Q. H.

Basic concept and theories relating to the study of man as a participant in group life with emphasis on social structure, socialization, social stratification, collective behavior, population, and the major institutional areas.

21.512, 21.513, 21.514 Social Research Methods I, II, III

Prereq. 21.503; 6 Q. H.

Selection of a research topic, specifying an appropriate study design, and the use of participant observation and personal documents. Examination of the techniques of experimentation, sociometry, survey, and small groups. Use of empirical data for drawing inferences and testing propositions about social behavior.

21.517 Foundations of Sociological Theory

Prereq. 21.503; 2 Q. H.

An historical survey of sociological theorists including the work of de Tocqueville, Comte, Marx, Durkheim, Cooley, and others.

21.518 Contemporary Sociological Theory I

Prereq. 21.517; 2 Q. H.

A study of major theoretical issues in sociology. Discussion concentrates on systematic questions and topics, as opposed to particular theorists, but material is drawn from theorists such as Weber, Simmel, Thomas, Mannheim, Merton, and Parsons.

21.519 Contemporary Sociological Theory II

Prereq. 21.518; 2 Q. H.

A seminar in which the principal focus will be upon questions of theoretical interest, e.g., the problem of order, the problem of change, the role of the individual in change. Students will present their papers in class.

21.528 Social Stratification

Prereq. 21.503; 2 Q. H.

A comparative study of the nature of class structure with emphasis on the United States and with reference to India and England. Discussion of such topics as theories of class structure, factors determining class membership, differential class behavior, and social mobility.

21.531 Social Change

Prereq. 21.503; 2 Q. H.

An analysis of the changing patterns in social and economic institutions, a discussion of modern social trends, and a review of current literature in the field.

21.534 Social Control

Prereq. 21.503; 2 Q. H.

The study of group membership as a determinant of behavior; analysis of status and role, patterns of authority, and group ideology as factors in the evaluation of conduct.

21.538, 21.539, 21.540 Introduction to Social Welfare I, II, III

Prereq. 21.503, 20.503; 6 Q. H.

History, philosophy, theory, and social welfare institutions including the following fields: family and child welfare, aging, mental health, corrections, public assistance, social insurances, and school and military social work.

21.543, 21.544, 21.545 Introduction to Social Work Practice I, II, III

Prereq. 21.540; 6 Q. H.

During the first quarter, the profession of social work is described. In the remaining quarters, a practicum of 4 hours per week in a social agency runs concurrently with class work devoted to discussion of practicum experiences.

21.547 Social Problems

Prereq. 21.503; 2 Q. H.

An overview of contemporary American social problems and the application of sociological concepts, methods, and principles to these problems.

21.548, 21.549 Criminology I, II

Prereq. 21.503; 4 Q. H.

Analysis of the patterns of criminal behavior, the causes of crime, and the relationship between law and crime.

21.550 Juvenile Delinquency

Prereq. 21.503; 2 Q. H.

A study of factors in delinquency and an examination of the implications for prevention, rehabilitation, and treatment.

21.551, 21.552 Family and Marriage I, II

Prereq. 21.503; 4 Q. H.

A comparative and historical treatment. The backgrounds of contemporary problems are discussed in the context of the functions, forms, and processes of this institution.

21.553, 21.554 Intergroup Relations I, II

Prereq. 21.503; 4 Q. H.

A study of the relationships between various racial, nationality, cultural, and religious groups with emphasis on historical development. Particular attention will be paid to American society with its specific problems of adjustment and assimilation.

21.557 Urban Sociology

Prereq. 21.503; 2 Q. H.

An analysis of the various causes, characteristics, and effects of urbanization in several different cultures of the world. Specific attention is given to the problems of urban and suburban living and the changing structure of the city.

21.558 Community Analysis

Prereq. 21.503; 2 Q. H.

Ecological theories of man's relation to his physical environment. Development of the concept, and discussion of community study methods. Contrasts between rural communities and urban neighborhoods. Discussion and evaluation of community action programs.

21.560 Medical Sociology

Prereq. 21.503; 2 Q. H.

Sociological concepts and research relating to the study of patterns of behavior in the areas of health and disease. Emphasis on the family, community, medical organizations, class and status, as social subsystems related to the field of health.

21.563 Social Gerontology

Prereq. 21.503; 2 Q. H.

An examination of social factors involved in aging, with specific reference to how biological and psychological age changes influence behavior, social roles and cultural patterns. The relation of aging to social change, and special provisions for the aged.

21.567 Population and Demography

Prereq. 21.503; 2 Q. H.

The use of demographic methods in the analysis of social structures. Introduction to the use of population size and composition, birth rates, and other demographic data in the comparative analysis of societies.

21.570 Sociology of Occupations and Professions

Prereq. 21.503; 2 Q. H.

The meanings of work. Division of labor and specialization. Analysis of the social relations within an occupation and among occupational groups. Analysis of occupational structure and of institutional aspects of an occupation, such as recruitment, training, career patterns and preferences. Relationships of supervisors, peers, colleagues, subordinates and clientele; their significance for work role behavior. Professionalization.

21.573 Sociology of Industry

Prereq. 21.503; 2 Q. H.

Comparison of pre-industrial and industrial society. The impact of industry on society; relationship between industry, culture, and values. The interrelationship between different occupations within a given work organization such as the factory, office, or restaurant. Diversification and specialization. Human relations in industry; analysis of subordinate-superordinate behavior, line and staff relationships, and of formal and informal groups.

21.575 Sociology of Formal Organizations

Prereq. 21.503; 2 Q. H.

A study of formal organizations and the principles that govern organizational life. Weber's theory of bureaucracy and the concept of authority; communication systems and other conceptions of formal organizations. The structure of work groups and their effect on the larger organization. The social content of organizations.

22—POLITICAL SCIENCE

22.501, 22.502, 22.503 Principles of Political Science I, II, III 6 Q. H.

An analysis of the concepts and basic structure of political institutions from Greece to the emergence of the modern nation-state. A comparative analysis of the structure and functions of totalitarian and constitutional systems in the contemporary world. A study of the international community including an introduction to international politics and American foreign policy.

22.504 Introduction to Political Theory

Prereq. 22.503; 2 Q. H.

Development of the political ideas of the Western world. The major philosophers of Greece, Rome, the Christian Era, and the Renaissance.

22.505 Contemporary Political Theory

Prereq. 22.504; 2 Q. H.

Political ideas and systems of political thought from Machiavelli to the present.

22.506 American Political Thought

Prereq. 22.503; 2 Q. H.

Political thought from the colonial period to the present including a study of the impact of religious, economic, and judicial theory on the structure of American ideas.

- 22.511 American National Government** Prereq. 22.503; 2 Q. H.
A study of the form and structure of the federal constitution and an analysis of the legislative process at the national level.
- 22.512 Urban and Metropolitan Government** Prereq. 22.503; 2 Q. H.
The political, structural, and functional problems of an urbanizing United States, including an analysis of urban, suburban, and metropolitan governments.
- 22.513 Political Parties and Pressure Groups** Prereq. 22.503; 2 Q. H.
Party government in the United States and Great Britain. A contrasting study focusing on the interaction of party and government.
- 22.514 American Constitutional Law** 2 Q. H.
A case analysis of the development of federalism, the separation of powers, and the role of the federal and state courts in constitutional development.
- 22.515 Civil Rights** 2 Q. H.
An evaluation of the quality and content of civil liberties in the United States. Emphasis will be placed on the first, fifth, sixth, fourteenth, and fifteenth amendments to the Constitution.
- 22.516 Public Administration I** 2 Q. H.
An introduction to the theory, forms and processes of administration at the national and state level.
- 22.517 Public Administration II** Prereq. 22.516; 2 Q. H.
Selected problems. Case-study approach to examination of relation between the theory and practice of public administration.
- 22.518 Government and Politics of the States** 2 Q. H.
A study of state and local government and problems and the function and operational responses to them.
- 22.521 Comparative Government I** Prereq. 22.503; 2 Q. H.
A comparative analysis of the structure and functions of the governments of Great Britain and the USSR.
- 22.522 Comparative Government II** Prereq. 22.521; 2 Q. H.
A comparative analysis of the structure and functions of the governments of France and Western Germany.
- 22.523 Government and Politics of Latin America** 2 Q. H.
Political behavior, economic institutions, and social environment of selected Latin American states are examined against the background of the continuing influence of the United States in this region.
- 22.524 Government and Politics of the Middle East** 2 Q. H.
A study of political change, economic growth, and social adaptation in selected countries of the Middle East. The role of the Middle East in world affairs, especially its ties with Northern Africa.

- 22.525 Government and Politics of the Far East** 2 Q. H.
Governmental systems, economic institutions, and social environment of the states of East Asia (China, Japan, Korea, Taiwan) are studied with reference to the special influence of Communist China in this region.
- 22.526 Government and Politics of Africa** 2 Q. H.
Government systems, political parties, socio-economic problems, and foreign policies are studied with reference to Africa's role in the international community.
- 22.527 Communism in Eastern Europe** 2 Q. H.
The communist political systems of eastern Europe and their socio-economic environments are studied in respect to their relationship with USSR.
- 22.531 International Relations** Prereq. 22.503; 2 Q. H.
Elements and limitations on national power. Contemporary world politics. Problems of cold and hot war.
- 22.532 International Organization** Prereq. 22.503; 2 Q. H.
Development of international organizations with special emphasis on the United Nations, specialized agencies, and regional organizations.
- 22.533 American Foreign Policy** Prereq. 22.503; 2 Q. H.
Formulation and conduct of American foreign policy. Role of the United States in world affairs since 1945.
- 22.534 Soviet Foreign Policy** 2 Q. H.
A study of the evolution of Soviet foreign policy since 1917 with emphasis on the development of the international communist movement.

23—HISTORY

- 23.501 Western Civilization I** 2 Q. H.
The beginnings of Western civilization with emphasis on the political, economic and social history of the ancient and medieval world.
- 23.502 Western Civilization II** 2 Q. H.
Modern Europe to 1815 with an examination of the two major intellectual movements—the Renaissance and the Enlightenment—and their impact upon religious movements, economic developments, and the rise of national states.
- 23.503 Western Civilization III** 2 Q. H.
Western civilization since 1815, emphasizing the Scientific and Industrial Revolutions and their impact upon democracy and authoritarianism, nationalism and internationalism, and war and peace.
- 23.504 United States, 1783–1845** 2 Q. H.
The United States from the close of the Revolution to the annexation of Texas, with primary attention to the political institutions and policies of the new Republic.

- 23.505 United States, 1845–1900** 2 Q. H.
The rise of sectional controversy in America, the Civil War, and the economic development of the nation after the war.
- 23.506 United States since 1900** 2 Q. H.
The United States in an age of urbanized industrialism and international crisis.
- 23.521 Ancient Middle East** 2 Q. H.
A study of ancient cultures including Sumer, Babylonia, Egypt and Israel.
- 23.522 Ancient Greece** 2 Q. H.
The origins and development of Greek civilization, with special emphasis on the political evolution of Hellenistic society.
- 23.523 Ancient Rome** 2 Q. H.
Roman civilization in ancient times, with special emphasis on the rise of the Republic and the decline of the Empire.
- 23.524 Early Middle Ages** 2 Q. H.
Europe from the decline of the Roman Empire to 1215, with emphasis on the role of religion in medieval society and the fashioning of political and economic institutions of feudalism and manorialism.
- 23.525 Late Middle Ages** 2 Q. H.
The medieval period from 1215 to 1500, with emphasis on the rebirth of classicism in literature and the arts.
- 23.526 Early Modern Europe** 2 Q. H.
The political, economic, and social history of Europe from the dawn of the modern age to the Glorious Revolution.
- 23.527 England, 500–1603** 2 Q. H.
England to the coming of the Stuarts, with an account of political, religious, and social developments.
- 23.541 Europe, 1688–1789** 2 Q. H.
Europe from the Glorious Revolution to the French Revolution, with emphasis on the impact of the Enlightenment.
- 23.542 Europe, 1789–1870** 2 Q. H.
Europe from the French Revolution to the Franco-Prussian War, with a stress on the struggles for liberalism and nationalism.
- 23.543 Europe, 1870–1914** 2 Q. H.
The background of World War I with an emphasis on the roles of nationalism, militarism, imperialism, and the European alliance system.
- 23.544 Europe, 1914–1939** 2 Q. H.
Europe from World War I to World War II, emphasizing the failures of peace-makers at Versailles and the subsequent rise of aggressive autocracies in Italy and Germany.

- 23.545 Europe since 1939** 2 Q. H.
World War II and its aftermath, with emphasis on the Cold War and attempts by European nations to unify the continent.
- 23.548 England, 1603–1815** 2 Q. H.
England in the Stuart and Hanover age, with emphasis on the victory of parliamentary institutions over the monarchy.
- 23.549 England since 1815** 2 Q. H.
The democratization of English life in the nineteenth and twentieth centuries, with emphasis on changing imperial and international relations.
- 23.552 English Constitutional History to 1485** 2 Q. H.
The development of the English constitution from Anglo-Saxon roots to the coming of the Tudors, with emphasis on local as well as central government.
- 23.553 English Constitutional History since 1485** 2 Q. H.
The victory of Parliament over the King and the subsequent democratization of England's governmental institutions and processes.
- 23.554 France since 1815** 2 Q. H.
France after Napoleon, emphasizing the continuing attempt by the French people to find satisfactory political institutions.
- 23.555 Germany since 1815** 2 Q. H.
An analysis of the role of nationalism in German life after 1815, with emphasis on unification, militarism, and imperialism.
- 23.556 Italy since 1815** 2 Q. H.
The unification of Italy, the attempt to establish constitutional monarchy, the rise of Fascism after World War I, and the movement toward democratic republicanism after World War II.
- 23.557 Ireland since 1800** 2 Q. H.
A study of the Irish Question in British politics from the Act of Union to the establishment of the Free State, with special emphasis on Ireland as an underdeveloped country.
- 23.561 Colonial America to 1689** 2 Q. H.
The exploration and settlement of North America, with emphasis on the establishment of political, social, and economic institutions.
- 23.562 Colonial America, 1689–1763** 2 Q. H.
North America in an age of international rivalry for the continent.
- 23.563 American Revolution and Constitution** 2 Q. H.
America's quest for independence from England and the efforts to establish governments in the new republic.

- 23.564 Topics in American Constitutional History to 1900** 2 Q. H.
Selected topics in the development of the American Constitution during the nineteenth century, with primary emphasis on federalism and the relations of governments and the economy.
- 23.565 Topics in Twentieth-Century American Constitutional History** 2 Q. H.
Topics include the conflict between the liberal and conservative attitudes toward the role of government in the economy and the role of the Supreme Court in the struggle for civil liberties and rights.
- 23.566 United States since 1933** 2 Q. H.
American society in a period of depression, war, and postwar crisis at home and abroad.
- 23.567 Topics in American Diplomatic History** 2 Q. H.
Selected topics in the history of American foreign policy from 1789 to the present.
- 23.568 Topics in American Social History** 2 Q. H.
Selected topics in the history of the American people since 1789.
- 23.569 Topics in American Economic History** 2 Q. H.
Selected topics in the development of the capitalist economy in America since 1789, with emphasis on the role of government.
- 23.581 Latin America to 1826** 2 Q. H.
The fusing of Indian, Iberian, and Negro cultures in Latin America, and the quest for political independence.
- 23.582 Latin America, 1826–1920** 2 Q. H.
The attempts by Latin Americans to establish democratic, stable societies, and the foreign relations of Latin American nations, especially with the United States.
- 23.583 Contemporary Latin America** 2 Q. H.
The struggles of Latin Americans for political, economic, and social development since 1920.
- 23.584 The Far East before 1850** 2 Q. H.
The history of China, Japan and other Asiatic places prior to their opening by the West in the mid-nineteenth century.
- 23.585 China since 1850** 2 Q. H.
A century of China's history with emphasis on the Western impact on Chinese civilization, China's struggle to maintain independence, and the victory of communism in the twentieth century.
- 23.586 Japan since 1850** 2 Q. H.
An analysis of Japanese domestic developments and foreign relations since the mid-nineteenth century, with emphasis on the Japanese quest for territory and power, World War II, and the post-war epoch.

- 23.588 Africa North of Sahara** 2 Q. H.
North Africa to the present, with primary emphasis on the European impact on the area, and the subsequent movement for political independence and economic development.
- 23.589 Africa South of Sahara** 2 Q. H.
A companion to course 23.588, with primary emphasis on the rise and decline of imperialism in the area.
- 23.591 Modern Middle East** 2 Q. H.
The Middle East since 1914, emphasizing Zionism, Pan Arabism, the effects of two world wars, and the post-war settlements.
- 23.592 India and Pakistan** 2 Q. H.
The political and religious history of the people who formed India and Pakistan, with an account of internal developments and foreign relations since independence.
- 23.593 Southeast Asia** 2 Q. H.
The cultures of the peoples of Southeast Asia, with an examination of the impact of European nations upon them and an account of their quest for national identity and economic development.
- 23.594 Russia, 1450–1801** 2 Q. H.
The emergence of Russia as a recognized European power, with an account of westernization and expansion in the eighteenth century.
- 23.595 Russia, 1801–1917** 2 Q. H.
The history of the Russian people and their government from the days of Czar Alexander I to the revolutions of 1917.
- 23.596 Russia since 1917** 2 Q. H.
The revolutions of 1917 and the subsequent history of the Russian people and their government, with special emphasis on foreign relations.

26—PHILOSOPHY

- 26.501, 26.502, 26.503 Introduction to Philosophy I, II, III** 6 Q. H.
An examination of the aims, functions, and methods of philosophy in comparison with other areas of human knowledge and valuation. The first quarter deals with the methods of philosophy and with the important issues which have arisen from a philosophical analysis of man's beliefs and values. The second quarter deals with theoretical and practical moral problems. The nature of morality, the various kinds of moral judgments, and some types of ethical theories are discussed. The third quarter critically compares various conceptions of the ultimate meaning of human existence. Discussion of the views of major philosophical schools on life, mind, freedom, and God. Concludes with the function and benefits of philosophical thinking.

26.504, 26.505, 26.506 Ancient and Modern Philosophy I, II, III 6 Q. H.

Development of western philosophical thought and its influence from the seventh century, B.C., to the twentieth century, A.D. Particular attention will be given to Plato and Aristotle in the ancient period and to Descartes, Locke, Hume, and Kant in the modern period.

26.507, 26.508, 26.509 History of Recent Philosophy I, II, III

Prereq. 26.503; 6 Q. H.

Philosophic trends in the nineteenth century considered as a background for the understanding of ideas influential in the twentieth century. Critical analysis and discussion of contemporary philosophical trends as represented by idealism, analytic philosophy, logical positivism, naturalism, and existentialism. Ayer, Carnap, Dewey, Lewis, Maritain, Moore, Sartre, Schlick are representative thinkers.

26.511, 26.512, 26.513 Philosophy of Art I, II, III 6 Q. H.

The nature, status, and function of art and beauty in their various forms in life. The relationship between the artistic-aesthetic and other human values and activities. Contrast between the practical, intellectual, and aesthetic impulse and attitude. Classical theories concerning art and the aesthetic experience. The problems of taste, standards of criticism, and objectivity of the aesthetic judgment. The arts, the artist, and society.

26.521, 26.522, 26.523 Philosophy of Religion I, II, III 6 Q. H.

A philosophical evaluation of religious experience and beliefs about the nature of God, the origin and the function of religion, and the major religious traditions. This course considers major problems such as natural and moral evil, the soul, immortality, miracles, prayer, and religious knowledge.

26.524, 26.525, 26.526 Great Eastern Religions I, II, III 6 Q. H.

Introduction to religion. Survey of terms, primitive religious development, and subsequent evolution into the sophisticated forms of the great eastern religions. Egyptian and Babylonian religions, Confucianism, Taoism, Hinduism, Buddhism, and Shintoism will be discussed.

26.527, 26.528, 26.529 Great Western Religions I, II, III 6 Q. H.

An introductory study to the historical, theological, and philosophical development of the great western religions, taken within their social contexts. Religions to be studied will include Zoroastrianism, Judaism, Christianity, Islam, and contemporary religious phenomena.

26.531, 26.532, 26.533 Ethics I, II, III 6 Q. H.

Introduction to ethical theory and its relation to concrete moral decisions. Stresses such moral problems as egoism and altruism, the meaning of good and evil, conscience, obligation and human freedom, and implications of modern psychological and sociological theories about men and society. Critical evaluation and discussion of some of the major ethical theories. The relations of ethical thought to religion, social philosophy, art, and science. Various texts in ethics will be read, and discussions will concern both texts and current ethical problems.

26.534 Logic

2 Q. H.

The art of correct thinking and effective discourse, enabling the student to analyze types of argument or discourse and to detect fallacies resulting from semantic confusion and methodological error. Exercises in the structure and logical relations of propositions, types of deductive reasoning, and other thought processes used to obtain clear verbalization. Nature of truth, proof, and their relationship to validity. The functions and relationships of deduction and induction, formal, and factual reasoning.

26.541, 26.542, 26.543 Social Philosophy I, II, III

6 Q. H.

Critical examination of the leading socio-political ideologies in regard to their conceptions of the character, structure, and function of society. Emphasis upon a normative approach to the principles, means, and goals which underlie these major conceptions. Main emphasis upon movements in modern era and thinkers such as Hobbes, Locke, Hegel, Mill, Marx, Lenin, Toynbee, and Whitehead.

27—FINE ARTS

27.501 Introduction to the Arts

2 Q. H.

Introduction to the techniques and meanings of various artistic expressions. The stylistic, aesthetic and social factors of painting, sculpture, drawing, architecture and graphic arts are studied in detail. The major stress of the course is on the visual arts.

27.504, 27.505, 27.506 Survey of Western Art I, II, III

6 Q. H.

A history of Western art, painting, sculpture, and architecture from prehistoric times to the twentieth century.

27.507 Ancient Architecture

2 Q. H.

Developments in the builder's art from prehistoric times to the end of the Classical Era, with emphasis on building methods, materials, and styles as they developed.

27.508 Medieval and Renaissance Architecture

2 Q. H.

A continuation of Ancient Architecture, this course includes a study of architecture from the Early Christian Period through the Renaissance.

27.509 European Architecture

2 Q. H.

A continuation of Medieval and Renaissance Architecture, this course deals with developments in the seventeenth, eighteenth, and nineteenth centuries, and those influences which have given rise to the leading styles of today.

27.511 History of Ancient Art

2 Q. H.

The materials and techniques of ancient artisans in architecture, sculpture, and painting. Includes a survey of prehistoric art, and the arts of ancient Egypt, Mesopotamia, Crete and Greece.

27.512 History of Medieval Art

2 Q. H.

Beginning with a study of ancient Rome and its people, the course includes a study of Roman art and architecture, Early Christian art, Christian symbolism, Byzantine art, Romanesque, and Gothic.

27.513 Italian Renaissance Art

2 Q. H.

Beginning with a study of Early Renaissance architecture and sculpture, then concentrating on Early Renaissance painting. The course traces the development of Italian art from the time of Brunelleschi, Ghiberti, and Giotto to the age of Leonardo da Vinci. The study of the High Renaissance includes painting, architecture and sculpture. The works of Michelangelo, Raphael and the Venetian school are studied in detail.

27.514 European Art

2 Q. H.

Traces the stylistic, social, technical, and historical development of painting, sculpture, and architecture from the late sixteenth century up to the end of the nineteenth century Romantic Period in Northern and Western Europe. The artistic expressions of El Greco, Brueghel, La Tour, Rubens, Frans Hals, Rembrandt, Velasquez, Poussin, Watteau, David, and others are studied in detail.

27.515 Modern Painting

2 Q. H.

The development of painting from nineteenth-century Romanticism to the present day. Includes a detailed examination of the social, technical and philosophical factors involved in the various schools of painting in contemporary American and European art. Emphasis is placed upon the works of French Impressionists, Post Impressionists, German Expressionists, Realists, Surrealists, and contemporary Abstraction. The works of Van Gogh, Gauguin, Seurat, Picasso, Braque, Miro, Kirchner, Munch, Klee and Kandinsky are studied in detail. Includes museum and art gallery visits and lectures.

27.521 Spanish Art

2 Q. H.

The study of Spanish art and painting from the Gothic to the nineteenth century including the work of such major painters as El Greco, Velasquez, Goya, and Zurbaran.

27.522 French Art

2 Q. H.

A detailed study of French painting and sculpture from the Renaissance period to the nineteenth century. Emphasis is placed upon the styles, technique and design of the work of such major figures in French art history as Poussin, Watteau, David, Delacroix, and Ingres.

27.523 English Art

2 Q. H.

English painting and sculpture from the Gothic to the nineteenth century. The works of the major figures in English art, such as Hogarth, Gainsborough, Reynolds, Turner, and Blake, are studied in detail.

27.524, 27.525, 27.526 History of American Art I, II, III

6 Q. H.

The development of American art from Colonial times to the present. The object of this course is to acquaint the student with the rise of architecture, sculpture, and painting in America. Lectures include discussion of techniques, styles, methods, and materials employed during the periods considered.

27.530 Byzantine Art

2 Q. H.

A study of architecture, painting, mosaics, and the minor arts of the Byzantine world from the fourth century through the middle of the fifteenth century.

- 27.531, 27.532, 27.533 Oriental Art I, II, III** 6 Q. H.
The major styles, techniques, and designs in the painting, sculpture, architecture, ceramics, and graphic arts of the Far East. The philosophical and religious influences which affect subject matter and style will be related to the works of art in the major historical periods of India, China, Korea, and Japan.
- 27.534 Russian Art** 2 Q. H.
A survey of Russian art from ancient Russia to the present. The influence of Byzantine art on early Russian painting and architecture, the effect of Westernization on art in St. Petersburg, painting of the nineteenth and early twentieth centuries, and the effect of the concept of socialist realism on modern Russian art.
- 27.535 African Art** 2 Q. H.
Various stylistic characteristics of sculpture and other artistic expressions of the major cultures of Africa from the thirteenth to the twentieth century.
- 27.536 Latin American Art** 2 Q. H.
Pre-Columbian and post-Columbian art forms of Latin America. Architecture, sculpture, painting, and the decorative arts are considered.
- 27.541, 27.542, 27.543 Drawing I, II, III** 9 Q. H.
Practice in the techniques and development of drawing in various media. Detailed study of anatomy.
- 27.544 Graphic Arts—Woodcutting** 3 Q. H.
Creative expression in the techniques of woodcuts and printing. Study of western and oriental woodcut prints.
- 27.545 Graphic Arts—Etching** 3 Q. H.
Practice and creative expression in process of etching and printing techniques. Technical study of etching in the history of art.
- 27.546 Graphic Arts—Lithography** 3 Q. H.
Creative expression in the techniques of lithography and printing.
- 27.551, 27.552, 27.553 Painting—Basic Level I, II, III** 9 Q. H.
Practice and creative expression in the technical fundamentals of figure and landscape painting.
- 27.554 Painting—Advanced Level** 3 Q. H.
Painting with concentration upon the development of personal expression and style.
- 27.561, 27.562, 27.563 Basic Color and Design I, II, III** 9 Q. H.
Study and practice of the principles of design and science of color.
- 27.564 Advanced Color and Design** 3 Q. H.
Creative expression in various color and design problems.
- 27.571, 27.572, 27.573 Basic Commercial Design I, II, III** 9 Q. H.
Study and creative work in layout, illustration, advertising and typography.

- 27.574 Advanced Commercial Design** 3 Q. H.
Creative design problems in illustration and advertising.
- 27.577, 27.578, 27.579 Stained Glass Design I, II, III** 9 Q. H.
History of the art and craft of stained glass. Students will design and make glass panels.
- 27.581 Basic Sculpture** 3 Q. H.
Fundamentals of techniques in sculpture and the casting process.
- 27.584, 27.585 Ceramics I, II** 6 Q. H.
Basic course in the techniques and practice of ceramics.
- 27.591 Art Seminar** 2 Q. H.
Specific techniques, problems, and theories in art. Students will be responsible for research projects and papers.

28—MUSIC

- 28.501 Introduction to Music** 2 Q. H.
The principal concern is to teach the student a technique for listening actively to music. The course surveys and analyzes works by J. S. Bach, Mozart, Beethoven, Wagner, Stravinsky, and others.
- 28.507, 28.508, 28.509 Fundamentals of Music I, II, III** 2 Q. H.
The development of music hearing skills and music reading through a new technique involving programmed instruction and audio-visual aids.
- 28.511 History of Music** 2 Q. H.
The men, ideas, and events that have dominated music history from ancient times through the Renaissance, Baroque, Classical and Romantic eras to our own day. Composers to be studied include Palestrina, Bach, Mozart, Beethoven, Wagner, Mahler and Stravinsky.
- 28.512 Music before 1750** Prereq. 28.501; 2 Q. H.
The evolution of music from the Gregorian chant to Bach. Discussion of organum, the church modes, the music of the troubadours, the motets and madrigals of des Prez, Lassus, and Palestrina, as well as the English madrigalists, concluding with Handel, Scarlatti, and Bach.
- 28.513 Music of the Classical Era** Prereq. 28.501; 2 Q. H.
A study of the period in music history extending from Bach to Beethoven characterized by the perfection of great forms such as the symphony and the concerto. Principal emphasis will be on the works of Mozart and Haydn with continuing reference back to the Bachs, who helped form the period, and forward to Beethoven, whose Romantic inclinations helped to end the period.
- 28.514 Aspects of Romantic Music** Prereq. 28.501; 2 Q. H.
Musical styles of the nineteenth century. Classicism and Romanticism. A detailed study of romantic realism (program music) and romantic idealism (personal expression) that followed Beethoven. Composers to be studied will include Tchaikovsky, Brahms, Wagner, Liszt, Berlioz, Mahler, and others.

- 28.515 Contemporary Music** Prereq. 28.501; 2 Q. H.
Contemporary music and its techniques seen as a mirror of our time. Major composers studied include Stravinsky, Debussy, Ravel, Bartok, Prokofiev, Hindemith, Milhaud, and Schoenberg.
- 28.520 Musical Forms** 2 Q. H.
The fugue; the sonata; theme and variations; rondo; the lied; analysis of the symphony, the string quartet, the opera, and the tone poem.
- 28.521 The Symphony** 2 Q. H.
A thorough study of the symphonies of Haydn, Mozart, Beethoven, Berlioz, Brahms, Dvorak, and Tchaikovsky. Aesthetic tone of the period and philosophical outlook of the composer are examined as they affect the structure and meaning of the music.
- 28.522 The Concerto** 2 Q. H.
The evolution of the concerto from its origins in the Baroque Period to its use in our time. Concertos for every instrument are studied, including piano, cello, violin, horn, organ, and bassoon. Composers studied include Vivaldi, Bach, Mozart, Beethoven, Brahms, Schumann, Rachmaninoff, Mendelssohn, and Tchaikovsky.
- 28.523 Great Literature for the Piano** 2 Q. H.
The study of pianoforte music written in the nineteenth and early twentieth centuries by masters such as Beethoven, Chopin, Schumann, Liszt, Debussy, and Ravel. The course will analyze the source of power and expressiveness generated in the sonatas and concerti of Beethoven; nocturnes and ballades of Chopin; and preludes of Debussy.
- 28.524 The World of Opera** 2 Q. H.
Distinctions will be made between music drama and the number opera. Students will be required to acquire librettos. Aria, recitative, ensemble and other basic elements of opera will be isolated and discussed. Analyses of complete operas will be made.
- 28.525 The World of Musical Comedy** 2 Q. H.
An historical survey and analytic study of musical shows from "The Black Crook" to "My Fair Lady" and "West Side Story." Major works by Romberg, Kern, Gershwin, Rodgers and Hammerstein, Lerner and Loewe, Bernstein, and others will be studied.
- 28.526 Jazz: Evolution and Essence** 2 Q. H.
The many roots of jazz and its development from the worksong and the vocal blues to the avant-garde experiments of today. Contributions of the major performers: soloists, arrangers, composers. The problems of "on-the-spot" creativity and personal expressions; the "beat"; multiplicity of accents.
- 28.531 Life and Works of J. S. Bach** 2 Q. H.
A comprehensive survey of the music and background of J. S. Bach with four areas of concentration: Bach and the figured bass; the young Bach (Baroque Romanticism); Bach, the churchman; Bach, the secular composer.

28.532 Life and Works of Mozart

2 Q. H.

The growth of Mozart from child prodigy to master composer. His mastery in all fields of music with particular emphasis on his development of the symphony and his achievements in opera. The man, as seen through his letters, as performer and composer; his humor and earthiness.

28.533 Life and Works of Beethoven

2 Q. H.

An analysis of the complex personality and art of this supreme musical genius. His relation to the turbulent times in which he lived; his role as the great transition figure in the passage from Classicism to Romanticism. His psychological and aesthetic growth will be observed by studying similar forms written in different periods of his life.

28.541 Nationalism in Music

2 Q. H.

The relationship of folk song, dance, and art to symphonic literature; nationalistic elements in the music of Dvorak, Tchaikovsky, Grieg, Copland, Shostakovich, Sibelius; the effect of ideology on composers; the Soviet composers.

28.542 Music of the U. S. A.

2 Q. H.

American music from the colonial times to the present; influence of Stravinsky and Schoenberg on American composers; music for the theatre; jazz, electronic music, and contemporary musical trends.

28.571, 28.572, 28.573 Piano Class I, II, III

6 Q. H.

Instruction for beginning piano students in a classroom environment and using the latest electronic equipment. Classroom sessions will include individual instruction and ensemble performance. Practice time will be available at the University.

28.574, 28.575, 28.576 Orchestral Instrument Class I, II, III

6 Q. H.

An opportunity for the student who already possesses some instrumental skills to receive training both in the performance of his instrument and in ensemble. Each student must furnish his own instrument and should have basic playing and music reading skills.

28.577, 28.578, 28.579 Choral Ensemble I, II, III

6 Q. H.

An opportunity for the student to receive training in group singing and to gain a working knowledge of choral literature. The course offers the possibility for participation in actual performances. Prior skill in music reading is not required.

29—SPEECH AND THEATRE ARTS

29.501 Effective Speaking I

2 Q. H.

Selection and organization of speech materials, essentials of good platform delivery, individual and class criticism of both prepared and impromptu speeches. A practical course devoted to developing an ability to speak easily, naturally and forcefully.

29.502 Effective Speaking II

Prereq. 29.501; 2 Q. H.

This course builds upon the techniques and principles developed in Effective Speaking I by stressing increased student proficiency. Speech organization and delivery of more complex materials with which the student is likely to be confronted in business, industry, or the professions will be studied.

29.503 Effective Speaking III

Prereq. 29.502; 2 Q. H.

Speech as related to practical aspects of business, industry, and the professions. The role of speech in a democracy. Group interaction in the formulation of ideas. The individual speaker as part of a group. The role of discussion in problem analysis, problem solving, and policy making. The principles and methods of organizing and participating in group discussions. Parliamentary procedure.

29.504, 29.505 Voice and Articulation I, II

4 Q. H.

A practical course aimed at developing vocal flexibility; theory of vocal mechanism; treatment of individual voice and articulation problems.

29.506 Oral Interpretation

2 Q. H.

Application of basic vocal techniques to the dramatic interpretation of various forms of literature.

29.511 Introduction to Theatre Arts

2 Q. H.

A course aimed at developing in theatregoers an appreciation of the total theatre experience, by studying the roles played by the artists and craftsmen of the theatre in bringing the playwright's script to life. The role of the director, actors, and designers. The role of the audience as critics.

29.521 Introduction to Dramatic Literature

2 Q. H.

The relationship between drama as literature and as theatre. Types of drama; comedy, tragedy, melodrama, farce and drawing-room comedy. The dramatist's attitude and his style: Classicism, Romanticism, Realism, Naturalism, and Theatricalism.

29.522 Masters of the Theatre I

2 Q. H.

The plays in relationship to their times, the theatre in which they were performed, and the dramatic theory of the age. A study is made of the plays of Aeschylus, Sophocles, Aristophanes, Plautus, Terence, and Seneca. Also studied are plays of the Medieval religious theatre of England, France, and Spain. Medieval secular drama (farce, interlude, folk plays) are discussed, as are the contributions of Jonson, Marlowe, Dekker, and Shakespeare.

29.523 Masters of the Theatre II

2 Q. H.

The art of the Italian *commedia dell'arte*, the Neoclassic theatre of Racine, Moliere, and Dryden, the Restoration theatre, and the plays of Goldsmith and Sheridan.

29.524 Modern European Drama

2 Q. H.

An examination of European drama of the late nineteenth century and of the twentieth century reflecting the changing views toward the nature of man and the techniques of theatre. Among the playwrights to be studied are Ibsen, Strindberg, Chekhov, Pirandello, Lorca, Brecht, and the Absurdist.

29.525 Modern British Drama

2 Q. H.

The drama of England and Ireland of the twentieth century, reflecting the impact of modern life upon modern theatre. Representative dramatists to be studied are Galsworthy, Barrie, Shaw, O'Casey, Coward, Osborne, and Pinter.

29.526 Modern American Drama

2 Q. H.

A view of American drama from 1900 to the present time. The American playwright reflecting the social, philosophical, and psychological temper. Among the playwrights to be studied are O'Neill, Anderson, Sherwood, Odets, Hellman, Williams, Miller, and Albee.

29.531 Contemporary Film

2 Q. H.

A survey of world film from the days of Edison's experiments to the present. Evaluation and critical review of representative films. Viewing of outstanding films.

29.541 Workshop for the Actor I

2 Q. H.

Physical preparation. Basic stage movement and deportment; the control of the stage voice; the analysis and establishment of characterization through observation and awareness of the body; improvisations and short scenes.

29.542 Workshop for the Actor II

Prereq. 29.541; 2 Q. H.

Psychological preparation. The analysis and establishment of characterization through memory, emotion, imagination, and recall. Analysis of specific roles; the creation of a character analysis book; improvisations and short scenes.

29.543 Workshop for the Actor III

Prereq. 29.542 2 Q. H.

Preparing and performing the role. The physical and psychological preparation of specific roles. Short classroom scenes; the presentation of a one-act play.

30—ENGLISH

Students enrolling in English (30.504) will be given a diagnostic test during the first meeting of class. The purpose of this test is to determine whether the student's level of preparation in English is sufficient to enable him to do the work required in the course. If his score indicates that he falls below the minimum level required, he will be given information about obtaining additional preparation from the Center for Programmed Study which is located in the Dodge Library.

30.501, 30.502, 30.503 English for International Students I, II, III

Prereq. none; 2 Cl.; non-credit

An intensive review of the basic mechanics of English grammar and punctuation. Reading essays for understanding. Both oral and written reports dealing with subjects related to American life. Writing business and social correspondence.

- 30.504, 30.505, 30.506 English I, II, III** 6 Q. H.
Review of grammar and punctuation through drill. A study of the techniques of exposition, description, argumentation, narration, and documentation; frequent theme assignments to develop skill in writing; related readings.
- 30.507, 30.508, 30.509 Introduction to Literature I, II, III** Prereq. 30.506; 6 Q. H.
Prose fiction, poems, and plays. Writing of short critical papers.
- 30.511, 30.512, 30.513 Business Writing and Reports I, II, III** 6 Q. H.
Detailed study of the business letter and other forms of writing required of the trained man in business, with special emphasis on vocabulary improvement and efficiency of communication. Analysis of the different types of business and semitechnical reports, format, and documentation. Illustrated lectures on research techniques and reference sources. The preparation of reports.
- 30.514, 30.515, 30.516 Technical Writing I, II, III** Prereq. 30.506 or equiv.; 6 Q. H.
Development of technical writing, editing, and graphic arts. Types of technical documentation, including proposals, reports, handbooks, parts lists, information retrieval, programmed instruction, and reproduction processes. Emphasis on practice in technical writing and preparation of graphic aids.
- 30.517 Intermediate Writing** Prereq. 30.506; 2 Q. H.
Practice in expository and imaginative writing in a variety of forms, designed to help the student discover his own style. Individual attention to the student's work.
- 30.518, 30.519 Creative Writing I, II** Prereq. 30.517; 4 Q. H.
A workshop in writing, analyzing, and editing short fiction. Assignments in varied styles and techniques are read in class, and problems of the author or the audience are discussed.
- 30.521 The English Language** Prereq. 30.506, 30.509 or equiv.; 2 Q. H.
An introduction to the scientific study of the nature of the English language. The backgrounds and historical development of the language are studied through sounds, grammar, and usage. The problem of meaning and symbolic nature of language are discussed.
- 30.522 Introduction to Semantics** Prereq. 30.506, 30.509 or equiv.; 2 Q. H.
The effect of language habits on thinking processes and on social relationship. Meaning as communicated through language.
- 30.531 Western World Literature I** 2 Q. H.
Major works of Greek literature, including Homer, the Greek tragedians, and Plato.
- 30.532 Western World Literature II** 2 Q. H.
Biblical and early Medieval literatures, and their influence on present-day thought and writing.
- 30.533 Western World Literature III** 2 Q. H.
European Renaissance literature, including Dante, Montaigne, and Cervantes.

- 30.534 Western World Literature IV** 2 Q. H.
The Neoclassic period in France and England, from Corneille to "The Fables" of La Fontaine.
- 30.535 Western World Literature V** 2 Q. H.
A study of the influence of such eighteenth-century writers as Voltaire and Rousseau on comparatively modern literature.
- 30.536 Western World Literature VI** 2 Q. H.
Celebrated poets and novelists of the nineteenth century in Europe, emphasizing their influence on the writers of England and America.
- 30.541 English Literature I** 2 Q. H.
A survey of major figures of early English literature, from the Anglo-Saxon period through the seventeenth century.
- 30.542 English Literature II** 2 Q. H.
English literature from the eighteenth-century satirists (Swift and Pope) to the early nineteenth-century romantics (Keats and Lamb).
- 30.543 English Literature III** 2 Q. H.
English literature from the mid-nineteenth-century essayists through the leading English writers of the twentieth century.
- 30.544 American Literature I** 2 Q. H.
American literature from Colonial times to the beginnings of the short story. The works of Bryant, Cooper, Irving, and Hawthorne will be emphasized.
- 30.545 American Literature II** 2 Q. H.
American literature from the triumph of the transcendentalist movement in New England to the period immediately preceding the Civil War. The works of Emerson, Thoreau, Poe, Longfellow, Holmes, Melville, and Whitman will be emphasized.
- 30.546 American Literature III** 2 Q. H.
The rise of Realism after the Civil War, the development of American humor, the appearance of local color writers, and modern trends since 1900.
Note: All English majors enrolling in Course 30.551 to 30.599 should have completed 30.509 and one full-year survey course (taken from those listed as 30.531 to 30.546) or secured the approval of the Dean.
- 30.551 Chaucer I** 2 Q. H.
"The Canterbury Tales," with attention to Middle English vocabulary, historical setting, and the rhythms and devices of Chaucer's poetry.
- 30.552 Chaucer II** Prereq. 30.551; 2 Q. H.
More of "The Canterbury Tales," and a beginning in the text of "Troilus and Criseyde."
- 30.553 Chaucer III** Prereq. 30.552; 2 Q. H.
An emphasis on "Troilus and Criseyde," and on certain shorter works of Chaucer.

- 30.554 Shakespeare I** 2 Q. H.
The status of the theatre in Elizabethan London, economic and political factors of the era, and Shakespearean criticism. "The Comedy of Errors," "A Midsummer Night's Dream," "The Merchant of Venice," "As You Like It," "Twelfth Night," and other plays will be studied intensively.
- 30.555 Shakespeare II** Prereq. 30.554; 2 Q. H.
Introducing the student to the "problematical" comedies of Shakespeare, and to the histories. The course includes "Cymbeline," "All's Well That Ends Well," "Measure for Measure," "Troilus and Cressida," "Richard II," "Henry IV," parts I and II, and other plays.
- 30.556 Shakespeare III** Prereq. 30.555; 2 Q. H.
Emphasis on the major tragedies of Shakespeare.
- 30.557 Restoration Literature** 2 Q. H.
Principal authors of the Restoration Period in England, including Wycherley, Locke, Dryden, Bunyan, Defoe, Congreve, and Pepys.
- 30.558 The Age of Pope and Swift** 2 Q. H.
The age of Pope and Swift, with selections from Addison and Steele, Thomson, Gray, and Fielding.
- 30.559 The Age of Johnson** 2 Q. H.
The age of Johnson, with selections also from Boswell, Gibbon, Burke, Paine, Burns, Blake, Goldsmith, and Sterne.
- 30.561 Spenser** 2 Q. H.
"The Faerie Queene," studied as the English culmination of Medieval and Renaissance romantic narrative.
- 30.562 Milton** 2 Q. H.
Close reading of "Paradise Lost," and of such political and theological background as needed. "Samson Agonistes" will also be read.
- 30.564, 30.565 The Old Testament I, II** 4 Q. H.
Selected books from the Old Testament, examined for their literary and historical importance.
- 30.566 The New Testament** 2 Q. H.
Selected books from the New Testament, considered in their literary and historical aspects.
- 30.571 Romantic Poets of the Nineteenth Century I** 2 Q. H.
Wordsworth and Coleridge, founders of the so-called Romantic Movement in poetry.
- 30.572 Romantic Poets of the Nineteenth Century II** 2 Q. H.
Concentration on the work of Shelley, Keats, and Byron.
- 30.573 Romantic Poets of the Nineteenth Century III** 2 Q. H.
Appraising the Victorian poets, especially Tennyson and Browning, and subsequently the pre-Rafaelites, Rossetti, Morris, and Swinburne.

- 30.574 The Eighteenth-Century English Novel** 2 Q. H.
Background to and early decades of the novel, with readings from such representative novelists as Defoe, Fielding, Smollett, Sterne, and Austen.
- 30.575 The Nineteenth-Century English Novel** 2 Q. H.
Study of such representative novelists as Emily Bronte, Thackeray, Dickens, Eliot, Meredith, and Hardy.
- 30.576 The Twentieth-Century English Novel** 2 Q. H.
Study of such twentieth-century novelists as Conrad, Woolf, Joyce, and E. M. Forster.
- 30.577 Conrad** 2 Q. H.
Conrad's art related to his Polish heritage, nautical career, theory of life and composition, and literary legacy.
- 30.581 The American Short Story** 2 Q. H.
The development of the American short story from its nineteenth-century origins to the present. Authors include Poe, Hawthorne, James, Hemingway, and Faulkner.
- 30.582 The Nineteenth-Century American Novel** 2 Q. H.
American fiction to the end of the nineteenth century, including Cooper, Hawthorne, Melville, Twain, James, and Howells.
- 30.583 The Twentieth-Century American Novel** 2 Q. H.
Some of the outstanding American novelists of the twentieth century, with emphasis on the social outlook they imply. Dreiser, Lewis, Dos Passos, Hemingway, Faulkner, Steinbeck, and others.
- 30.584 Contemporary American Poetry** 2 Q. H.
To give the student a perspective on the poetry of his own time, and to help him understand and enjoy poetry generally. The course deals with American poetry of the last fifty years and concentrates on contemporary works.
- 30.585 The Modern Novel** 2 Q. H.
Important twentieth-century Western writers will be considered from a social, psychological, philosophical, literary, and historical viewpoint. Kafka, Joyce, Proust, Camus, Mann, Gide, and others.
- 30.586 Literary Criticism** 2 Q. H.
Major schools of criticism through a study of Aristotle, Longinus, Sidney, Johnson, and a representative group of moderns.

31—FRENCH

- 31.501, 31.502, 31.503 Elementary French I, II, III** 9 Q. H.
Stresses the essentials of grammar, practice in pronunciation, and progressive acquisition of a basic vocabulary with idiomatic expressions. Written and oral exercises are based upon simple French prose. Develops into the reading of more difficult work accompanied by practice in conversation.

31.504, 31.505, 31.506 Intermediate French I, II, III

Prereq. 31.503 or equiv.; 9 Q. H.

A review of grammar. Reading of French prose of moderate difficulty. Emphasis is placed upon the acquisition of reading and conversational ability through the use of written and oral exercises.

32—SPANISH**32.501, 32.502, 32.503 Elementary Spanish I, II, III**

9 Q. H.

Stresses the essentials of grammar, practice in pronunciation, and progressive acquisition of a basic vocabulary with idiomatic expressions. Written and oral exercises are based upon simple Spanish prose. Develops into the reading of more difficult work accompanied by practice in conversation.

32.504, 32.505, 32.506 Intermediate Spanish I, II, III

Prereq. 32.503 or equiv.; 9 Q. H.

A review of grammar. Reading of Spanish prose of moderate difficulty with practice in conversation. Emphasis is placed upon the acquisition of reading and conversational ability through the use of oral and written exercises.

33—GERMAN**33.501, 33.502, 33.503 Elementary German I, II, III**

9 Q. H.

Stresses the essentials of grammar, practice in pronunciation, and the acquisition of a basic vocabulary; the study of idiomatic expressions and use of subjunctive mood. Develops into the reading of more difficult work accompanied by practice in conversation.

33.504, 33.505, 33.506 Intermediate German I, II, III

Prereq. 33.503 or equiv.; 9 Q. H.

Reading of German prose of moderate difficulty, with practice in conversation. Introduction to the history of German civilization through texts of average difficulty; review of grammar; oral and written exercises.

34—RUSSIAN**34.501, 34.502, 34.503 Elementary Russian I, II, III**

9 Q. H.

An introductory course starting with the Russian alphabet; stress is placed on grammar, practice in pronunciation, acquisition of a basic vocabulary with idiomatic expressions. Written and oral exercises are based upon simple Russian prose accompanied by practice in conversation.

34.504, 34.505, 34.506 Intermediate Russian I, II, III

Prereq. 34.503; 9 Q. H.

Reading of Russian prose of moderate difficulty, including some attention to scientific writings, with practice in conversation. Emphasis is placed upon the acquisition of reading and conversational ability through the use of oral and written exercises.

34—JAPANESE

34.521, 34.522, 34.523 Elementary Japanese I, II, III 9 Q. H.

An introductory course starting with the Japanese alphabet; stress is placed on grammar, practice in pronunciation, acquisition of a basic vocabulary with idiomatic expressions. Written and oral exercises are based upon simple Japanese prose accompanied by practice in conversation.

34.524, 34.525, 34.526 Intermediate Japanese I, II, III

Prereq. 34.523 or equiv.; 9 Q. H.

A review of grammar. Reading of Japanese prose of moderate difficulty. Emphasis is placed upon the acquisition of reading and conversational ability through the use of written and oral exercises.

34—ITALIAN

34.531, 34.532, 34.533 Elementary Italian I, II, III 9 Q. H.

Stresses the essentials of grammar, practice in pronunciation, and the acquisition of a basic vocabulary with idiomatic expressions. Written and oral exercises are based upon simple Italian prose. Develops into the reading of more difficult work accompanied by practice in conversation.

34.534, 34.535, 34.536 Intermediate Italian I, II, III

Prereq. 34.533 or equiv.; 9 Q. H.

A review of grammar. Reading of Italian prose of moderate difficulty with practice in conversation. Emphasis is placed upon the acquisition of reading and conversational ability through the use of written and oral exercises.

38—JOURNALISM

38.501 History and Principles of Journalism I 2 Q. H.

Journalism from its European origins into the Colonial Period. The evolution of press freedoms and principles in the Colonial Press and the Party Press. Contributions of journalism to society and to the development of our culture. Introduction to fundamentals of newswriting.

38.502 History and Principles of Journalism II Prereq. 38.501; 2 Q. H.

Journalism from 1800. The "Dark Period," the "Penny Press," and the great Personal Journalists: Bryant, Bennett, Greeley, Raymond, and others. The historic leadership role of the press. Principles of newswriting and some newswriting assignments.

38.503 History and Principles of Journalism III Prereq. 38.502; 2 Q. H.

The "giants" of American journalism in the closing decades of the 19th Century: Dana, Greeley, Ochs, White, Medill, Pulitzer, Hearst, and others. The "muckrakers" of the 20th Century and "Yellow Journalism." The role of journalism in modern society. Discussion and demonstration of news-writing principles.

38.504 Newswriting I Prereq. 38.503; 2 Q. H.

Obtaining and organizing facts; the writing of basic news stories. Subjects covered include the five "W's" and the "H" of news, inverted pyramid form, news values, and leads.

38.505 Newswriting II

Prereq. 38.504; 2 Q. H.

Analysis of different types of news stories through assignments and class discussions; building news stories; news interview stories, and other types.

38.506 Newswriting III

Prereq. 38.506; 2 Q. H.

Investigative reporting, feature stories, editorials. Copy editing exercises and assignments. Discussion and assignments in specialized writing. Libel, slander, and other legal matters affecting journalism.

39—ECONOMICS

39.500 Economic Geography

2 Q. H.

Physical geography; resource distribution; and the development of agriculture and industry, with emphasis upon basic economic institutions.

39.501, 39.502, 39.503 Economic Principles and Problems I, II, III

6 Q. H.

Introduction to economic theory and problems. Business cycles, money and banking systems, fiscal policy, economic growth, fluctuations in national income, as well as the economic problems of monopoly, industrial relations, international economic problems and competing economic systems. Emphasis is placed on basic principles and laws and consideration is given to current economic problems.

39.507, 39.508, 39.509 Intermediate Economic Theory I, II, III

Prereq. 39.503; 6 Q. H.

Detailed development of classical equilibrium theory. The determination of prices and outputs. Theory of the firm. Introduction to mathematical analysis, as well as comprehensive analysis of the theory of distribution.

39.510 Statistics for Quality Control

Prereq. 10.503 or equiv.; 2 Q. H.

Fundamentals of statistical concepts and computations necessary to the understanding of statistical quality control. Frequency distributions; measures of centering and dispersion; computation of average and standard deviation for ungrouped and grouped data; determination of areas under the normal distribution curve; standard error of the mean. Combinations and permutations and their use to compute probabilities; computations associated with the hypergeometric, binomial, and Poisson distributions.

39.511, 39.512, 39.513 Statistics I, II, III

Prereq. 39.503; 6 Q. H.

Statistical techniques and their application; descriptive measures of shape, location, and dispersion; an introduction to probability; sampling and simple analysis of observed distributions; advanced concepts in probability; sampling and statistical inference; time series analysis; correlation and index numbers.

39.517, 39.518 Money and Banking I, II

Prereq. 39.503; 4 Q. H.

Institutional aspects of our monetary and banking system. Problems and policies of central banking in the United States as well as a study of the theory of money and prices, including such topics as money creation, interest theory, and monetary policy.

39.519 Public Finance

Prereq. 39.518; 2 Q. H.

History of United States public economy. Intergovernmental fiscal relations. Growth and development of the public economy as a part of the national economy. Public finance policies.

39.521 Introduction to Economic Growth and Development

Prereq. 39.503; 2 Q. H.

Examination, through an historical survey, of the rise and development of the Western market system. An introduction to the phenomenon of growth, which is central to the field of economic development, and a discussion of the alternative approaches to economic development.

39.522 Economic Development

Prereq. 39.503, 39.521; 2 Q. H.

An introductory discussion of the economic factor in civilization, followed by an examination of the psychological, social and political influences on economic change. The role of various economic institutions in secular development.

39.523, 39.524 Government and Business I, II

Prereq. 39.503; 4 Q. H.

The role of government in economic affairs. The relationship between government and business. Theoretical analysis of interaction of various sectors of the economy.

39.525 American Economic History

Prereq. 39.503; 2 Q. H.

Economic development of the United States from the Colonial Period to the present; emphasis upon the period since the Civil War. Consideration of related European developments.

39.526 Government and Business

Prereq. 39.503; 2 Q. H.

The role of government in economic affairs. The relationship between government and business. Theoretical analysis of interaction of various sectors of the economy.

39.527 Labor Economics

Prereq. 39.503; 2 Q. H.

Development of present day labor organizations, their aims and methods. Issues involved in collective bargaining. Economic implications of labor market policies. Public policy toward labor relations.

39.528, 39.529 International Economics I, II

Prereq. 39.503; 4 Q. H.

Survey of the development of international commercial policies in recent times. Analysis of international economic principles and of international organizations.

39.530 Comparative Economic Systems

Prereq. 39.503; 2 Q. H.

Analysis and evaluation of different economic systems; capitalism, socialism, communism and fascism.

39.531, 39.532 Business Cycles I, II

Prereq. 39.503, 39.513; 4 Q. H.

Theories of business cycles and their impact. Measurement of business fluctuations and forecasting. Analysis of forecasting services and business conditions.

- 39.533 Business Planning and Research** Prereq. 39.503, 39.513; 2 Q. H.
Sources of information, strengths and weaknesses of principal measures of business activity; use of widely accepted indices in general business forecasting; sales forecasting, business cycle analysis and the effects of the broadening impact of government policies upon the individual business firm.

- 39.536, 39.537 Statistical Methods in Forecasting I, II** Prereq. 39.503, 39.513; 4 Q. H.
Introduction to the application of time series and analysis. Among the principal topics considered are the measurements of secular trends by free hand and mathematical methods; the measurement of seasonal fluctuations; cyclical fluctuations; the general nature and calculation of index numbers; and a discussion of regression and correlation.

- 39.538 Management Statistics and Business Application** Prereq. 39.503, 39.513; 2 Q. H.
A business-oriented study of statistical decision-making; formulation and testing of hypotheses concerning averages, proportions and deviations of single samples and differences between statistics and pairs of samples.

- 39.539 Managerial Economics** Prereq. 39.503; 2 Q. H.
An intensive analysis of the business firm with respect to demand, cost, capital budgeting, and the implications of varying market structures for price-output relationships.

- 39.540 History of Economic Thought** Prereq. 39.503; 2 Q. H.
Development of economic theory. The major contributions of the various schools of economic thought including the Keynesian school and later contributions.

40—LIBRARY SCIENCE

- 40.501 Introduction to Library Science** 2 Q. H.
Brief survey of the history of books and librarianship. The development of libraries in the United States with some emphasis on recent federal and state library legislation. The library profession, its philosophy, publications, and organizations.

- 40.502 Selection of Library Materials** 2 Q. H.
Principles and practices in the selection of printed materials and audio-visual aids for the modern library; practice in preparation of book notes and book reviews.

- 40.511 Organization of the Library** 2 Q. H.
The organization, administration and services of municipal libraries, with particular emphasis on the larger unit systems; the role of public libraries as educational institutions.

- 40.512 Building and Administering the School Library** 2 Q. H.
Organization and management of elementary and secondary school libraries; problems in the selection and evaluation of books, periodicals, and audio-visual aids necessary to the school curriculum.

40.513 School Library Administration

2 Q. H.

The library as a center for instructional materials; problems in personnel and budgeting; the library's role in the school curriculum and its services to students and faculty.

40.521 Reference Materials and Information Services

2 Q. H.

The basic tools and methods for locating information. Evaluation of dictionaries, encyclopedias, gazetteers and atlases, handbooks, directories and indexes.

40.522 Advanced Reference and Bibliography

Prereq. 40.521; 2 Q. H.

A subject approach to the landmark reference books in the social sciences, sciences and humanities; other areas considered are government documents, national and trade bibliographies.

40.531 Introduction to Cataloging and Classification

2 Q. H.

Theory and practice in descriptive cataloging, using the Anglo-American Cataloging Rules; emphasis on Dewey Decimal Classification, Sears subject headings, and Cutter-Sanborn numbers.

40.532 Advanced Cataloging and Classification

2 Q. H.

Further study of descriptive cataloging and classification; introduction to corporate entries, serials, non-book materials, and Library of Congress classification and subject headings.

40.541 Introduction to Children's Literature

2 Q. H.

The history and development of children's literature; current trends in its publication and the social forces that influence its production; standard practices of selection and evaluation of the various types of children's books.

40.542 Library Service to Young People

2 Q. H.

Study of adolescent interest and academic needs in the field of literature with application to both public and school libraries; special attention to the problems of book selection, book talks, and discussion groups.

40.551 Special Libraries

2 Q. H.

The purpose, development, and administration of the special library—industrial, scientific, business, and other types; techniques for making unique materials and services available.

41—ACCOUNTING

41.501, 41.502, 41.503 Accounting Principles I, II, III

6 Q. H.

Emphasis is placed on acquiring an understanding of fundamental accounting principles as a background to business. Topics include the basic accounting process and the analytical and interpretive aspects of accounting as a managerial tool.

41.504, 41.505, 41.506 Accounting—Intermediate I, II, III

Prereq. 41.503; 6 Q. H.

For students who intend to specialize in accounting. Emphasis is placed on the understanding of the logical development of accounting principles, standards, and concepts as a foundation for advanced accounting work. Special problems of inventory valuation, income-determination, use of funds, and cash flow are a few of the corporate problems considered.

41.507, 41.508, 41.509 Accounting—Cost I, II, III

Prereq. 41.506; 6 Q. H.

The purpose of this course is to examine in detail the specialized problems of cost accumulation and cost analyses for executive planning and control. Although emphasis is placed on cost accounting as a highly developed quantitative system to help managers select and reach their objectives, ample attention is given to basic cost accounting methods and procedures.

41.510, 41.511, 41.512 Accounting—Advanced I, II, III

Prereq. 41.506; 6 Q. H.

This course is a continuation of 41.506. Students are provided with an analytical basis to encourage participation in critical evaluation of accounting concepts. Valuation accounting is stressed by emphasizing the effect of accounting valuation upon the financial statements.

41.513, 41.514, 41.515 Accounting—Specialized Problems I, II, III

Prereq. 41.512; 6 Q. H.

The application of fundamental theory to special business fields and business activities such as non-profit organizations, partnerships, estates and trusts, insolvent companies and consolidated financial statements. Emphasis is placed on accounting principles and their application to various situations.

41.516, 41.517, 41.518 Auditing I, II, III

Prereq. 41.512; 6 Q. H.

Auditing techniques, procedures, concepts and standards employed by independent public accountants. Emphasis is placed upon the legal and ethical responsibilities of the independent Certified Public Accountant in conducting an audit and upon the role and importance of internal control. Stress is placed on understanding the objectives and nature of the audit, and the coordination of the examination of accounts and their effect upon the financial statements.

41.519, 41.520, 41.521 Federal Income Taxes I, II, III

Prereq. 41.518; 6 Q. H.

The federal tax laws and their application to the income of individuals, partnerships and corporations. The Internal Revenue Code, federal regulations and related court decisions. Research problems are assigned to students in order to acquaint them with the working tools of tax practice—the complete Federal Tax Library. Tax planning is stressed throughout the course.

41.522, 41.523, 41.524 Seminar in Contemporary Accounting Problems I, II, III

Prereq. 41.515, 41.521; 6 Q. H.

The historical progress of accounting; its relation to the other disciplines—economics, law, statistics; the development and present position of the basic concepts, conventions, and principles which underlie accounting. Attention is focused on those areas in which the accounting profession is most concerned and is currently attempting to achieve some uniformity. The significance and limitation of generally accepted accounting principles, postulates and conventions.

41.529 Analysis of Financial Statements (offered in odd-numbered years)

Prereq. 41.505; 2 Q. H.

Techniques used by management, creditors, investors, and regulatory authorities in analysis and interpretation of financial statements for establishing credit ratings; testing operation efficiency; proving effectiveness of financial and operating policies. Published corporate reports are used as case material.

41.530, 41.531, 41.532 Controllership Accounting I, II, III

Prereq. 41.512; 6 Q. H.

Functions and organization of the controller's department; basic techniques employed by the controller; budgeting; the interpretation of historical results and their coordination into the broad policy-making program of the business.

41.533, 41.534, 41.535 Accounting for Management Decisions I, II, III

Prereq. 41.503; 6 Q. H.

The use of accounting information for managerial decision making; cost flow, cost-volume-profit relationships, flow of funds and cash, coordinated budget, cost-analyses applied to decision-making; planning capital expenditures; pricing decisions; the use of qualitative techniques.

41.536 Distribution Cost Analysis (offered in even-numbered years)

Prereq. 41.503; 2 Q. H.

Cost accounting with major emphasis on applications for marketing purposes and cost accumulation and analysis; uses of costs and cost techniques for control. Pricing will be stressed.

43—MARKETING

43.501, 43.502, 43.503 Introduction to Marketing I, II, III

6 Q. H.

The first quarter covers the description and evaluation of facilities and method used to plan, operate, and evaluate marketing programs. The second quarter continues this study with emphasis upon applications through the use of cases and decision making. The third quarter continues the case method of decision making and includes reading, discussion, and analysis of current marketing topics.

43.507, 43.508, 43.509 Sales Management I, II, III

Prereq. 43.503; 6 Q. H.

The basic principles of personal selling, the development of sales techniques, the role of personal selling in creative marketing efforts, the development of sales operations through wholesalers, distributors, retailers, and direct to the user in both consumer and industrial channels; the organization of the sales department, the selection of salesmen, the planning and direction of sales force activities, the operation of the sales force, the evaluation of the results obtained, and decision making required in managing the sales operation.

43.511, 43.512, 43.513 Creative Marketing Communications I, II, III

Prereq. 43.503; 6 Q. H.

The first quarter introduces the student to all the tools of the "advertising and communications mix," followed by the study of the principles and techniques of advertising and their use in the creative marketing effort. The second quarter expands on the creative aspects of advertising and covers the principles, techniques, and materials of sales promotion and their coordination with advertising and personal selling in the effective stimulation of sales. The third quarter uses the case method to develop decision-making ability in the management of all of the tools of the "communications mix."

43.518, 43.519 Retailing I, II

Prereq. 43.503; 4 Q. H.

Retail store operation management and merchandising. Store location, buying, pricing, advertising, display, sale promotions, management responsibilities, store layout, organization, personnel management, merchandise handling, sales staff supervision, customer services, retail accounting and control, and store protection and maintenance.

43.520 Industrial Marketing

Prereq. 43.503; 2 Q. H.

This course explores the marketing of products where other business firms and organizations are the customers. An analysis will be made of the cooperation and conflict demanded of and resulting from the interaction of the customer, seller, competitor, and government.

43.525, 43.526 Marketing Research I, II

Prereq. 39.513, 43.503, 45.572; 4 Q. H.

Investigative and evaluative procedures and techniques now available to improve the chances for marketing success. Modern techniques of data collection and analysis, with emphasis upon quantitative analysis and forecasting, qualitative aspects of marketing research, including marketing analysis, product planning, test marketing, evaluation, and application of modern data-processing techniques.

43.529 International Marketing

Prereq. 43.509; 2 Q. H.

Opportunities, methods and policies in the development and management of international business and marketing operations.

43.532, 43.533, 43.534 Marketing Management I, II, III

Prereq. 43.503; 6 Q. H.

The decision-making and managerial aspects of the complete marketing spectrum. Analysis of a variety of problems and situations through case studies. Marketing for both the consumer and the industrial goods market. Emphasis on seminar type programs during second and third quarter, including problem solving in sales, physical distribution, advertising, pricing, new-product development, and the requirements of public and governmental policy.

43.536 Advertising Techniques

Prereq. 43.503; 2 Q. H.

A study of the verbal and visual means of motivation, with emphasis upon the techniques and processes used to produce advertising in newspapers, radio, television, and other media.

43.538 Sales Engineering

2 Q. H.

Surveys the problems and presents the techniques required to successfully sell engineered products such as capital goods, systems, installations, and original equipment.

43.541, 43.542 Public Relations I, II

Prereq. 43.503; 4 Q. H.

An introduction to the basic principles, purposes, and methods of public relations, followed by in-depth coverage of the planning, management, operation, and evaluation of public relations programs.

44—FINANCE AND INSURANCE

44.501, 44.502, 44.503 Capital Institutions and Risk Management I, II, III

6 Q. H.

An introduction to the role of finance and insurance in the economic world. A survey of financial institutions and their functions and an analysis of the basic institutions and principles in risk and insurance.

44.507, 44.508, 44.509 Corporate Finance I, II, III

Prereq. 39.503, 41.503; 6 Q. H.

An analytical approach to the financial management of the business firm. Stress is placed on the importance of cash flow in analysis. The theory of optimum return on optimum assets is developed under the goal of maximizing the owner's position. Theories of capital budgeting and cost of capital are further developed and applied against considerations of acquisition of both short term and long-term assets. Internal sources of funds are discussed.

44.510 Personal Finance

2 Q. H.

A discussion of money, its function, dollar value; expense control through budgeting; wise buying methods and policies—charge accounts; installment buying; financial institutions for borrowing money; protection against risk to person and property; methods of saving; the place of life insurance in financial planning; owning a home; investing in securities; trust funds, investment trusts; making a will; business fluctuations and the planning of personal finances.

44.511, 44.512 Life Insurance I, II

Prereq. 44.503; 4 Q. H.

Investment aspects of life insurance and modern approaches to personal and business uses. Types of contracts are analyzed from both the buyer's and the company's point of view: Legal concepts, the beneficiary clause, riders, protective clauses and settlement options, including analysis of the life insurance contract, are discussed and supplemented by recent court cases.

Types and organization of companies, including investment policy, underwriting and marketing. Risk measurement, rate-making principles and techniques, including reserves and surrender values, are presented.

44.513 Estate Planning

Prereq. 44.512; 2 Q. H.

Wills, taxation, the marital deduction and life insurance are explained in detail. Forms of trusts, gifts and joint ownership are considered as tools

available in the estate plan. The nature and process of estate planning is described by evaluating impairments, forming the estate plan and testing the designed plan.

44.514, 44.515, 44.516 Property and Casualty Insurance I, II, III

Prereq. 44.503; 6 Q. H.

Thorough analysis of the fire insurance, automobile, and general liabilities policies, homeowner's contract, workmen's compensation and fidelity and surety bonds. Inland marine and selected casualty coverages are presented. Underwriting practices and problems and loss prevention and adjustment in property and casualty lines are discussed. A brief introduction to rate making. Reserves and reinsurance. Government regulation is discussed.

44.517, 44.518, 44.519 Investments I, II, III

Prereq. 44.509; 6 Q. H.

Investment goals and objectives considered. Various types of investment compared and role of securities market examined. Attention given to the relationship between the economy and stock price averages; methods of analyzing and appraising developments within the firm; the relation or earnings dividends and cash flow to market valuation of a company's securities; and portfolio analysis and planning. General methods of security selection, formula plans and a comparison of technical and fundamental factors are considered.

44.520 Life Insurance Problems

Prereq. 45.550; 2 Q. H.

A case study examination of actual life and health insurance applications placing considerable emphasis on student participation.

44.521, 44.522, 44.523 Credit Management I, II, II

Prereq. 44.509; 6 Q. H.

Considers the matter of extension of credit and collection of receivables within the business firm. Emphasis placed on measurement of individual and general risk involved. Types of credit discussed; evidences of debt, collateral, and collateral documents; sources of credit information; evaluation of risk; collection procedures and rights of creditors.

44.524 Property and Casualty Insurance Problems

Prereq. 45.550; 2 Q. H.

A case-study examination of actual property and casualty insurance applications placing considerable emphasis on student participation.

44.525, 44.526 Health and Social Insurance I, II

Prereq. 44.513; 4 Q. H.

Developments in the field of private health insurance; health insurance related to programs for public health and preventive medicine, public assistance and social insurance. Social security, unemployment insurance, workmen's compensation, etc., are thoroughly considered.

44.527 Business and Group Insurance and Pension

Prereq. 44.526; 2 Q. H.

An analysis of types of insurance of primary interest to the business firm. Types of group insurance programs and related problems, company and union pension plans, and employee benefit rights are examined.

- 44.528 Insurance for Management** Prereq. 44.503; 2 Q. H.
Risks present in modern business operation procedures to be taken with types of insurance used to indemnify against anticipated losses.

- 44.531, 44.532 Seminar in Finance I, II** Prereq. All Finance Courses and 45.547; 4 Q. H.
Student participation in the study and analysis of case histories. Individual papers presented.

45—MANAGEMENT

- 45.501, 45.502, 45.503 Management and Organization I, II, III** 6 Q. H.
Fundamental concepts of management and organization are first developed. These concepts are then applied to the management and organization of the basic business functions: marketing, production, personnel, and finance.

- 45.504 Office Organization and Management** 2 Q. H.
The organizational, environmental, personnel, and operational problems encountered by the manager of the modern office. Proper selection techniques, supervision, adequate compensation policies; employee relations; efficient office layout; working conditions; analysis of office methods and systems; work simplification; selection and use of office machines; and common office functions.

- 45.505 Production and Inventory Control** 2 Q. H.
Application of graphical and mathematical methods of controlling production throughput and inventory levels; economic order quantities; scheduling including critical path methods; PERT; deterministic mathematical models; introduction to probabilistic inventory models.

- 45.506, 45.507, 45.508 Industrial Management I, II, III** Prereq. 45.503; 6 Q. H.
Principles and techniques in the successful administration of manufacturing management; study of management and organization; policy determination; plant location; labor requirements; materials handling; routing of operations; personnel selection and training; job evaluation; wage and salary structures; motion and time study; quality, inventory production, and cost control systems. (Not available to Industrial Management Majors.)

- 45.510 Labor Management Relations** Prereq. 39.503; 2 Q. H.
History of the labor movement and American industrial relations developments, law, and institutions; theory of collective bargaining and the practice of management and of unions; bargaining negotiations, strikes and public policy in industrial relations and wage bargaining; employment problems, economic growth and structure change.

- 45.511, 45.512 Human Relations in Personnel I, II** Prereq. 19.503; 4 Q. H.
A foundation course in personnel management, oriented especially to the supervisor's responsibilities. Includes situation analysis; problems in recruitment, selection, and training; creation and implementation of wage

and other policies; complaints, grievances, and related disciplinary procedures; employee morale; labor turnover; health and safety; employee participation; collective bargaining; incidental public relations; elements of effective supervision.

45.513 Personnel Management I

2 Q. H.

The organization, function, and procedures of the personnel department. Its relationship and responsibility in the management organization; manpower requirements; recruitment; interviewing; counseling; selection; testing; placement; training; job analysis and evaluation; merit rating; promotion, transfer, discharge; employee publications; standards and conditions of employment; personnel policies, benefits, forms; records and reports.

45.514 Personnel Management II

Prereq. 45.513; 2 Q. H.

Principles, methods, and techniques used in training; a grounding in the psychology of learning; methods of analyzing and meeting training needs; techniques of effective teaching; a review of the types of training found in industry; principles and practices of organizing training activities; practical applications of training methods used in industry.

45.515 Personnel Management III

Prereq. 45.514; 2 Q. H.

Controlling and coordinating the combined positions of managerial capacity involving the responsibility of supervision; basic instruction in supervisor's responsibilities and objectives; planning the work and employee assignments; employees' attitudes toward management; records and reports; improving individual performance; progress of employees; personnel relations; handling of grievances; training; administering of company policies; matters related to wages; the development of a congenial, enthusiastic community of work interest through the coordination of the work of all employees.

45.517 Techniques of Employee Selection

Prereq. 39.513; 2 Q. H.

Recruitment, selection, and placement techniques including pre-employment and post-employment testing, with emphasis on supervisory and professional employees.

45.518 Wage and Salary Administration

Prereq. 39.503, 45.503; 2 Q. H.

Theory of wage and salary determination and administration; merit and incentive plans; wage and salary structure; methods of compensation and the significance of compensation in employer-employee relations and in the economy.

45.519 Work Simplification

2 Q. H.

Process analysis with process charts and flow diagrams; operations analysis; work place improvement with operator charts and the Principles of Motion Economy; memomotion techniques; information flow simplification; multiple activity charting; brainstorming; fundamentals of human engineering; human aspects of work simplification. Laboratory practice.

45.520 Work Measurement

2 Q. H.

Measurement of worker and machine output to establish basic data in development of production and wage standards; individual and group incentive plans; incentives for indirect labor; development of standard data; administration of incentives; cost reduction. Laboratory practice.

45.521 Employee Benefits

Prereq. 39.503; 2 Q. H.

Private and public programs directed toward the problems of job and worker income insecurity; unemployment in a free labor market, public unemployment compensation, training and employment services; private plans to guarantee wage income and work opportunity; severance pay and reemployment rights. Includes the study of old-age retirement, public pensions and survivor benefits; private pension plans and compulsory retirement; disability from nonoccupational causes, hospitalization and medical group insurance plans and income insurance; workmen's compensation for industrial accident and disease protection; economic, fiscal, and administrative considerations in developing and operating employer and union-management programs in private business and industry.

45.522 Job Evaluation

Prereq. 45.503; 2 Q. H.

Fundamental concepts of wage-payment systems; theory of wage determinations, job elements, rating scales, writing job descriptions and specifications; selection of appropriate rating plans; setting up job factors and maximum point values; use of several methods of determining specific point values; development of wage structures and integration with the principles of merit rating.

45.523, 45.524, 45.525 Management Seminar I, II, III

6 Q. H.

The development of an integrated analysis of business problems from the upper-management point of view. This course provides an opportunity to bring theory into practice through case study analysis.

45.526 Plant Layout

Prereq. 45.532; 2 Q. H.

Principles and objectives of plant layout; machine-load analysis and flow-process charting; types of layout—characteristics and evaluation; planning for utilities and services; basics of Program Evaluation Review Technique (PERT); Monte Carlo simulation technique; break-even comparison method; rate of return and cost reduction evaluation; travel charting for optimum layout; material handling and other related approaches to the over-all plant-layout problem. Projects.

45.530 Development of Standard Data

Prereq. 45.520; 2 Q. H.

A practical and economical approach to the development of production standards for job-shop operations using the six basic forms of data; namely, curve, table, equation, nomograph, family, and multivariable. The tools learned here should reduce greatly the cost of time study, minimize inaccurate time standards, and extend incentive opportunities.

45.531 Material Handling

2 Q. H.

Fundamentals of material handling and storage operations usually encountered in industrial plant and commercial operations. Emphasis on problem identification and analysis, cost factors, characteristics and application of basic handling equipment such as manual and powered trucks, conveyors, elevators, cranes, and monorail systems. Evaluation of storage and packaging procedures and facilities.

45.532 Handling Systems Design

Prereq. 45.531; 2 Q. H.

Application of material-handling techniques to industrial-plant operations, including detailed analysis of receiving, raw-material storage, manufacturing process, finished-product warehousing and shipping operations. Examination of the principles of automation, establishment of management objectives, and development of plant handling and material-control systems.

45.533, 45.534, 45.535 Management Decisions and Policies I, II, III 6 Q. H.

Broad-spectrum decision-making to set rather than follow policy. Students will engage in all aspects of the decision-making process: fact finding, analysis of findings, and effective communication.

Case studies, outside readings and business games. In the first term, short written analysis of each case will be required from each student, and classroom emphasis will be placed on analysis and effective communication. In the second term, students will submit a report based on their own original research. In the final term, emphasis will be placed on team and group activities in business environment. This course is open to all students with an average of 3.0 or better.

45.536 Principles of Material Inspection

2 Q. H.

An operating and technical-level course involving mensuration, need and function of inspection and specifications; basic principles and techniques of measurement; various methods and equipment used for gauging and measuring; special measuring and inspection problems; quality control and process inspections.

45.537, 45.538, 45.539 Purchasing I, II, III

6 Q. H.

The role of purchasing in modern business. Organization for purchasing, purchasing policies, purchasing methods, selection of sources, specifications, contractual implications, forms, and records. The economics of purchasing. Market exploration, bid analysis, pricing policies, vendor analysis, quality control, inventory systems, and inventory control. Value analysis, packing and shipment, warehousing and distribution, adaptations of purchasing to EDP, negotiation, and performance evaluation.

45.541 Law I

2 Q. H.

CONTRACTS: Nature, kinds, and formation of contracts; essential elements; form and interpretation of contracts; breach, remedies, and damages.

45.542 Law II

Prereq. 45.541; 2 Q. H.

AGENCY: Nature, purpose, and formation of agency relationships; rights and duties of principal and agent, scope of agent's authority; rights and duties of principal and third persons; termination of agency.

SALES: Nature of sales contracts; warranties; transfer of title; rights and remedies of seller and buyer.

45.543 Law III

Prereq. 45.542; 2 Q. H.

NEGOTIABLE INSTRUMENTS: Bills, notes, and checks; requirements of a negotiable instrument; liabilities and defenses of parties; procedure upon dishonor; discharge.

PARTNERSHIPS: Nature, kinds, and formation; rights and duties of partners; partner's authority to bind firm; relation of partners and third persons; dissolution and winding up.

- 45.544 Manufacturing Processes** Prereq. 45.509; 2 Q. H.
Analysis of advanced manufacturing processes; equipment selection; replacement policies; automation and its problems; computer controlled processes. Use of case studies.

- 45.545 Law of Employment Standards** Prereq. 45.510; 2 Q. H.
The history and development of minimum-wage laws, both state and federal; Federal Wage and Hour Act (Fair Labor Standards Act) regulations on hours of work, minimum wages and child labor, and state regulations. The Walsh-Healey Public Contracts Act as it affects employment practices of contractors who supply materials to the Government. The Davis-Bacon Act, Contract Work-Hours Standards Act. Administrative and enforcement procedures.

- 45.546 Law of Employment Conditions** Prereq. 45.510; 2 Q. H.
Substantive and administrative provisions of the Labor Management Reporting and Disclosure Act; the Social Security Act; the Massachusetts Employment Security Act; The Massachusetts Workmen's Compensation Act. The state and federal laws and regulations relating to discrimination in hiring and employment; veterans' reemployment rights.

- 45.547 Law of Finance** Prereq. 44.509, 45.543; 2 Q. H.
A consideration of the legal problems immediately affecting finance. Special attention is given to the field of corporate law.

- 45.548 Law of Labor Management Relations** Prereq. 45.510; 2 Q. H.
The legal framework for collective bargaining, beginning with the historical development and the impact of the antitrust laws on labor unions; the federal and state laws regulating injunctions in labor disputes; the Railway Labor Act; the National Labor Relations Act; the Labor-Management Relations Act (Taft-Hartley); the procedures, powers and limitations of the agencies administering the statutes.

- 45.550 Law of Insurance** Prereq. 45.513, 45.543; 2 Q. H.
A consideration of the legal problems affecting insurance. Analysis of legal problems involved in the insurance contract, in the relationship of company to customers, agent to customer, etc. Consideration of warranties and conditions affecting the risk.

- 45.553 The Labor Agreement** Prereq. 45.510; 2 Q. H.
The nature and content of labor contracts; component clauses such as union recognition and security, management prerogatives, seniority, vacations, wages, hours, working conditions; grievance analysis and arbitration procedure. Case studies in actual labor-management relations affected by such clauses; the entire collective bargaining agreement and relationship.

- 45.554 Business Conference Techniques** Prereq. 45.503; 2 Q. H.
A study of the group process; how groups develop and the effective utilization of the group as a management tool; instruction in the planning and techniques of leading a conference; the analysis and evaluation of the group process. Classes are limited in size to allow regular and frequent participation by the students.

45.555 Recent Labor Social Law

Prereq. 45.521, 45.546; 2 Q. H.

An advanced discussion of current labor-management problems such as union responsibilities, management responsibilities, the guaranteed annual wage, profit sharing, criteria for wage determination, welfare programs. Includes a study of the Civil Rights Acts of 1964, medical and other amendments to the Social Security Act and the Equal Pay Act.

45.556 Negotiation, Mediation, Arbitration

Prereq. 45.510; 2 Q. H.

Technical aspects of the collective-bargaining process; preparation and negotiation of demands and revising of agreement terms; the mediation process; fact-finding by neutral third parties; arbitration by neutrals; tripartite fact-finding and arbitration; grievance arbitration and processing; enforcement of voluntary agreements to arbitrate; compulsory arbitration, seizure, and other alternatives to the right to strike.

45.557 International Labor Movements

Prereq. 45.510; 2 Q. H.

Historical treatment of American labor union developments in the eighteenth century; theories of labor organization; economic and political action; relation of labor and government, legislature, judicial, administrative, and executive; comparison of American, European, and Latin-American labor organization and institutions affecting workers; international labor organizations.

45.558 Industrial Relations Systems

Prereq. 45.557; 2 Q. H.

Differences between and similarities of collective-bargaining institutions of different industries and trades in the U.S., the reasons and the effects; structures of union-management relations in different industries and companies; comparisons of the international differences in management practices, government programs, and collective bargaining.

45.560 Seminar on Labor Issues

For seniors only

Prereq. 45.546, 45.548, 45.553; 2 Q. H.

An advanced discussion of current labor-management issues and related national policy for industrial relations disputes, wage guidelines, public employees' union, etc.

45.561 Statistical Quality Control I

Prereq. 39.510 or 39.513; 2 Q. H.

Description and practical application of the basic statistical quality-control methods for quality assurance, quality control, and quality improvement of products and services; the tools for reducing and controlling the costs of scrap, rework, repair, customer complaints and warranty. The determination of process capability; use of histograms to identify abnormal variability; the use of quality-control charts for measurable and nonmeasurable quality characteristics, including Shewhart, Multi-Vari, median, per cent defective and defects per unit; corrective-action techniques; complying with government quality-control-system requirements; psychological factors in controlling quality.

45.562 Statistical Quality Control II

Prereq. 45.561; 2 Q. H.

Continuation of Statistical Quality Control I, covering the application of statistical and probability considerations in acceptance sampling of purchased material, work-in-process and outgoing products. Methods of predicting sampling results using the hypergeometric, the binomial, and the

Poisson distributions; development of the Operating Characteristic Curve for any sampling plan; risks involved in sampling and the concepts of AQL, RQL, AOQL. Use of standard sampling tables to select appropriate sampling plans, including Mil-Std-105 and 414; practical administration of sampling programs, material review boards, and quality audit.

45.563 Management of Quality Control

2 Q. H.

Modern concepts of managing the quality function of a company to maximize customer satisfaction at minimum quality cost. The idea of Total Quality Control; measurement of the costs of quality; use of Pareto's Rule to identify the major unsolved quality problems, development of a coordinated program of improvement, organizing for diagnosing the defect causes. The Quality Control system; improvement and control of vendor quality; in process control; outgoing product control; customer quality relations. Organizing of the quality function.

45.565 Industrial Experimentation I

Prereq. 39.513 or 45.564; 2 Q. H.

Modern small-sample techniques are applied to industrial problems. Use of statistical inference to make estimates and set confidence intervals of key characteristics of production lots and processes; design of single- and multiple-factor experiments; tests of significance; analysis of variance; use of the normal, binomial, Poisson and Chi-Square distributions, as well as non-parametric methods; shortcuts and "rough-but-quick" tests. Emphasis is on avoiding experimental blind alleys, with the associated vital savings in dollars and days.

45.566 Industrial Experimentation II

Prereq. 45.565; 2 Q. H.

Tests of significance, analysis of variance, correlation techniques, and experiment design. Balancing and randomizing techniques; factorial designs; nested designs, Latin Square, Random-Balance, Multiple-Balance.

45.567, 45.568, 45.569 Reliability-Maintainability Management I, II, III

Prereq. Calculus Fund. or equiv.; 6 Q. H.

Development of reliability-maintainability control concepts and techniques for application to complex military and commercial products. Derivation of fundamental principles for product reliability, maintainability, availability, warranty, and similar performance measures. Concepts and techniques developed during the first quarter are put into use via organization, management, and conduct of a hypothetical reliability-maintainability program.

45.570, 45.571, 45.572 Electronic Data Processing I, II, III

6 Q. H.

The first two quarters acquaint the executive, accountant, and methods and systems analyst with automatic electronic equipment and its potential applications. A comprehensive survey of the machine components of such systems, their characteristics, and assembly to handle various business accounting problems; comparison of speed, capacity, flexibility, reliability, and cost; discussion of input and output devices, memory (storage), arithmetic, and control elements; elementary programming, number systems; integrated data processing in businesses, such as retail sales, inventory, payroll, and banking accounting. The third quarter is spent studying the use of EDP as a tool of management.

This study includes the use of EDP in such areas as forecasting, inventory, production scheduling, and distribution. The basic principles of operations research and their application to business problems; the use of PERT as a scheduling and control technique. Hybrid centralized-decentralized management through computer time-sharing. Other trends.

45.573 Basic Computer Programming

Prereq. 45.572; 2 Q. H.

Concepts and techniques of programming. Problems and exercises in flow-charting, preparation of machine instructions, and actual program checkout utilizing EDP System installed at the University Computation Center Laboratory. Principles of programming in both machine and symbolic language.

45.574 Computer Programming for Business I

Prereq. 45.573; 2 Q. H.

Builds upon Basic Computer Programming (45.573) through symbolic language programming. Emphasis is given to business programs by development of such areas as peripheral equipment, macro and subroutine programs, and techniques used for program checkout. Debugging techniques are employed in a program test system for checkout of assigned programming problems.

45.575 Computer Programming for Business II

Prereq. 45.574; 2 Q. H.

Presentation of more sophisticated business-oriented applications of programming techniques including sorting, file maintenance, inventory control, billing and sales analysis. Development of concepts of integrated data processing. Introduction to such specialized areas as COBOL, FORTRAN, Real Time, Monitors and Control Systems.

45.576 Common Business-Oriented Languages (COBOL)

Prereq. 45.575; 2 Q. H.

The sophisticated programming languages which permit the user to produce a running EDP program more quickly. Compilers, report generators, sorts, executive and monitor routines and their use. Programming of examples using COBOL, the Common Business-Oriented Language adopted as the standard business programming language for the EDP industry.

45.577 Data Systems Administration

Prereq. 45.572; 2 Q. H.

The effective use of data-processing equipment and management sciences in meeting the information needs of business can result only from much study and detailed planning. This course is designed to treat the major phases in such a program. The analysis of company objectives, the feasibility study, the system specifications, equipment selection, and the implementation of the new system.

45.578, 45.579 Business Data-Processing Applications I, II

Prereq. 45.572; 4 Q. H.

The application of EDP techniques to specific business applications. Illustration of variations in processing requirements between industries, development of examples of the techniques applied to their solution and the timing and cost considerations involved. The course covers the systems consideration of a variety of input and output techniques including such areas as returnable media for promotion and billing operations and also communications for operation with remote locations. Alternative approaches to updating

of files; techniques for control and checking; time-sharing through the technique of multi-programming and multi-processing. Case studies.

45.580 Punch Card Accounting

Prereq. 41.503; 2 Q. H.

Designed to give accountants, methods men, and executives a working knowledge of punch card accounting, what it can do, and what its limitations are. A comprehensive coverage of available equipment and of installation and operational techniques; working demonstrations of various types of equipment. The course is constantly updated to keep pace with current developments.

45.583 Computer Programming for Scientific Applications

Prereq. 45.573; 2 Q. H.

Designed for people whose professional background and current occupation, in either the physical or social sciences, require a working knowledge of modern, problem-oriented, computer programming. Topics included are: basic organization of a digital computer; the FORTRAN programming language; and selected applications to typical problems.

45.584, 45.585 Concepts of Reliability Engineering I, II

Prereq. Calculus Fund. or equiv.; 4 Q. H.

The application of reliability engineering techniques to practical problems. Statistical tools used for estimating and measuring the probability of early, random and wear-out failures. Component and simple-system reliability predictions. Reliability mathematical models and predictions are developed for complex series, and active and standby parallel systems. Reliability demonstration tests and assessments, confidence limits and preventive-maintenance policies are covered.

45.586, 45.587, 45.588 Systems Design and Techniques I, II, III

Prereq. 41.503, 45.503, 45.572; 6 Q. H.

Definition of a business in terms of its major functions in order to build a framework for an information or control system. Development of a systems philosophy with considerations of external and internal environment factors. Examples of the design of typical subsystems such as order entry, purchasing, production control, and payroll and their relationship to the total system will be studied. Includes a survey of techniques of systems design, analysis, and appraisal. Methods of obtaining data and cost. Interviewing techniques. Policy and Procedural Manuals. Flow charts and forms design. Charting techniques. The preparation of systems reports and proposals. A study is made of the applications of work simplification and measurement in practice. Case study, analysis of systems problems involving both theory and method. The evaluation of business organization from a systems design perspective.

45.589, 45.590, 45.591 Advanced Systems Design I, II, III

Prereq. 45.588; 6 Q. H.

A detailed analysis through case studies of the existing structure of the various subsystems of a business and their relationships to each other and to the whole. The analysis will form the basis for improvement of systems design through the definition of the inputs and outputs required by these subsystems and the techniques of introducing the inputs and producing the outputs.

45.592, 45.593, 45.594 Advanced Systems Techniques I, II, III

Prereq. 45.581, 45.591; 6 Q. H.

A detailed survey of management sciences techniques such as linear and quadratic programming, variants and regression analysis, and queuing theory; simulation and gaming theory, decision structure tables, dynamic programming, real time monitoring and control program design, and numerical control programs.

45.595, 45.596, 45.597 Manufacturing Seminar I, II, III

For seniors only

6 Q. H.

Problems of manufacturing operations at the plant-manager level; economics of production when considering aspects of specialization, simplification, standardization, and diversification, expansion, contraction, or integration; materials, plant location and layout, power maintenance, labor supply, organization and wage policy. Consideration of the controls of the manufacturing process: product development, scheduling, inventory, quality, cost, and budgetary controls.

45.598 Maintainability Engineering

Prereq. Calculus Fund or equiv.; 2 Q. H.

Mathematical concepts associated with maintainability technology and their application to the solution of practical problems. Maintainability as a major element of the "system effectiveness" concept. These mathematical methods and tools are extended to the solution of problems having one or more constraints involving spares provisioning, repair-level, built-in-test, module size, preventive maintenance, and repair technical training.

45.620, 45.621 Industrial Safety I, II

4 Q. H.

Organization and administration of a comprehensive accident-prevention program; analysis of basic industrial hazards; factors involved in industrial accidents with corrective action; responsibilities and function of top management, the safety engineer, the supervisor and the safety committee; training programs; accident investigation; promoting management participation.

45.623 Manufacturing I

2 Q. H.

The derivation, characteristics, and applications of materials used in industry. Basic metallurgy of ferrous and non-ferrous metals and alloys. Elementary chemistry of both organic and inorganic non-metals. The thermal, physical, electrical, and chemical properties of both metals and non-metals. The combining of metals and non-metals to develop characteristics not found in either. Practical and theoretical limitations of known materials and approaches taken to meet requirements generated by aerospace development.

45.624 Manufacturing II

2 Q. H.

Processes and methods used by industry in the manufacture of items from metallic and non-metallic materials. These include casting, hot and cold working, joining, machining, using general- and special-purpose manufacturing equipment. Factors that govern the selection of a manufacturing process; the relationships of process to material; the effect of the process on the physical properties.

45.625 Manufacturing III

Prereq. 45.624; 2 Q. H.

Analysis of advanced manufacturing processes; equipment selection; replacement policies; automation and its problems; computer controlled processes. Use of case studies.

45.627 Value Analysis and Planning I

2 Q. H.

An industry proven technique for analyzing a product or process in terms of value, function and cost relationship for the purpose of lowering its cost without sacrificing essential quality. Special emphasis will be placed on functional analysis and creativity. Case studies.

45.628 Value Analysis and Planning II

2 Q. H.

Analytical approach to optimizing costs through defining product function, establishing dollar value function, revealing excessive costs and developing alternate methods. Areas pertaining to human relation factors, suppliers, the specialty vendors, product design and suggestion programs will be thoroughly investigated. Students will select a product from their plants and apply the techniques of value analysis under the direction of the instructor.

45.630 Introduction to Operations Research

Prereq. 10.506; 2 Q. H.

An introduction to operations research for management. Following an analysis of the idealized research model, a study is made of inventory models, allocation models (including linear programming and the transportation problem), waiting-time models (queuing theory), replacement models, and competitive models (game theory, business games).

45.631, 45.632 Operations Research Applications I, II

Prereq. 45.630; 4 Q. H.

The various models covered in Introduction to Operations Research are set up in more complex form and are solved using the University's computer on a closed-shop basis. The FORTRAN programming language is taught and used for solving these problems.

45.633 Advanced Quality Control I

Prereq. 45.562; 2 Q. H.

Detailed study of specialized techniques used in defect-cause diagnosis and problem analysis. Complete analysis of process capability; the Multi-Vari chart; pictograms; the Span Plan method. Dissection of variability into time, stream, positional components; diagnosis for non-measurable quality characteristics. Use of special graph papers for computational simplification.

45.634 Advanced Quality Control II

Prereq. 45.564; 2 Q. H.

Continuation of Advanced Quality Control I, with special emphasis on design of control plans for process quality control and special cases of product acceptance. Special-purpose quality-control charts; narrow-limit gaging; Pre-Control; Lot Plot inspection method; construction of special variables acceptance plans. Control plans for Setup-dominant and time-dominant operations; training, qualification and motivation of operators for control of operator-dominant operations. Job-Shop Quality Control.

45.649, 45.650, 45.651 Law of Real Estate I, II, III

Prereq. 45.543, 47.502; 6 Q. H.

Specific examination of the legal problems involved in instruments of conveyance, recording, and registration; the legal relationship of brokers and managers, landlords and tenants; and the legal complexities involved in marriage and death.

47—REAL ESTATE

47.501 Real Estate Fundamentals I

Prereq. 44.503; 2 Q. H.

An examination of title and the legal process involved in acquiring real estate and a general examination of real estate financing, leases and licensing, valuation, taxes, etc.

47.502 Real Estate Fundamentals II

Prereq. 47.501; 2 Q. H.

The operation of a real estate firm with specific attention to appraising, residential and commercial sales, home building, urban renewal, and industrial and shopping center development.

47.506 Real Estate Construction Principles

Prereq. 47.502; 2 Q. H.

Methods of estimating for building operations, determining material and labor quantities from working drawings and specifications; consideration of job costs, insurance, taxes, etc. Importance of building codes, ordinances and administrative orders.

47.508, 47.509 Real Estate Financial Analysis I, II

4 Q. H.

Analysis of problems and risks involved in financing and investing in real property. Government agency requirements, sources of funds, borrowing methods, effect of taxes, etc.

47.510 Real Estate Management

Prereq. 47.509; 2 Q. H.

The problems involved in managing a real estate firm and real property management are carefully considered.

47.511 Residential Real Estate Appraisal

Prereq. 47.502; 2 Q. H.

A fundamental course in real estate appraisal with emphasis on single- and two- and three-family properties. Analysis of city and neighborhood influences; site evaluation; building diagnosis, depreciation; study of the applicable approaches to value; appraisal report preparation.

47.512, 47.513 Commercial and Industrial Real Estate Appraisal I, II

Prereq. 47.502; 4 Q. H.

An advanced course in the evaluation of income properties. Application of the cost, market and income approaches to apartment buildings, and commercial and industrial developments. Particular emphasis on the various methods of capitalization and residual techniques.

47.521, 47.522, 47.523 Urban Planning, Rehabilitation and Development I, II, III

Prereq. 47.502; 6 Q. H.

An analysis of current regulations, practices, and goals relating to the planning and rehabilitation of urban areas. Special emphasis is placed on urban renewal and methods of rehabilitating specific areas.

48—TRANSPORTATION

48.501, 48.502, 48.503 **Transportation Management I, II, III** 6 Q. H.

Evaluation of all transportation modes, singly and in combination with one another. Analysis of the bill of lading and other transportation documents. Study of primary concepts in transportation pricing: freight classification, classification rule and freight rates. Study of primary freight-management functions: use of tariffs and rate procedure with carrier bureaus and the Interstate Commerce Commission; routing and consolidation of freight; special services performed by carriers—diversion reconsignment, transit, protective services, storage, tracing, switching, pickup and delivery, weighing, loading and unloading; freight-claim procedure and prevention. Management of a private transportation system; exporting and importing; inventory management; materials handling and packaging; warehousing; and factors of industrial location.

48.504, 48.505, 48.506 **Transportation Regulation and Promotion I, II, III**

Prereq. 48.503; 6 Q. H.

Study of transportation regulation as it is practiced by both federal and state governments. History and content of the Interstate Commerce Act—its impact upon carriers and upon industrial activity. Study of cases pertinent to the Commerce Clause. Examination of Administrative Law and Procedure, the Code of Ethics and the General Rule of Practice. Complete review and preparation for the Interstate Commerce Commission Practitioners Examination.

48.511, 48.512, 48.513 **Railroad Transportation and Warehousing I, II, III**

6 Q. H.

Railroad transportation—brief history of American railroads and assessment of their present position and impact on national economy. Analysis of pending mergers and development of current marketing and sales programs for both freight and passenger traffic. Primary stress on operating problems occasioned by industrial needs for service and also compelled by inter- and intra-modal competition. Analysis of the relative efficiency of the principal modes of transportation.

Warehousing management—study of materials storage as an integrated element in the transportation of freight, in the reduction of distribution costs, and in the improvement of service through more precise selection of facilities.

48.517, 48.518, 48.519 **Motor Carrier Management I, II, III** 6 Q. H.

Motor carrier operations—mission and characteristics of the industry. Types of carriers—common contract, private, exempt, and local. Internal organization and administration. Sales and public relations policies. Terminal and operating management: selection, financing, maintenance, and replacement of equipment; industrial relations; safety, insurance, and taxation. Packaging and claim management—analysis of the factors involved in developing quality protection of goods, thereby lessening and ultimately eliminating claims for damage and assuring greater customer satisfaction.

48.521, 48.522, 48.523 Physical Distribution Management I, II, III

Prereq. 48.506, 48.526; 6 Q. H.

Procedures for the reduction of distribution costs. Case problems on the function of warehousing as a method to stabilize prices and control markets. Development of a management viewpoint which will effectively relate the transportation department to all other industrial activities. A transportation survey is made, and appropriate policies for procedural action are established. Specific problems of both transportation carriers and industrial transportation departments are diagnosed and treated by the case method. Problem-solving discussions.

48.524, 48.525, 48.526 Transportation Economics and Rate Making I, II, III

Prereq. 48.506; 6 Q. H.

Study of the economic theories underlying transportation-management decisions from both the industrial and carrier viewpoint. Principal stress on the cost factors in pricing. Analysis of the tools and techniques of rate-making. Exploration of rate structures and preparation of a rate case. Emphasis from the industrial viewpoint. Carrier policy on freight rates. Rate Bureau research and analysis procedures. Function of the Interstate Commerce Commission when industry and carriers disagree.

48.541, 48.542, 48.543 Air Transportation I, II, III

6 Q. H.

The economics and regulation of scheduled passenger service and scheduled cargo service. Corporate and general aviation policy-making and procedures. Areas of specific study include route structures, equipment, scheduling, operations, pricing, cost analysis and financing.

48.544, 48.545, 48.546 Urban Transportation I, II, III

6 Q. H.

Analysis of highways and public transportation systems in moving large numbers of people in congested areas at peak periods. The relevance of distribution and growth of population and land utilization in urban areas. Comprehensive planning to determine the nature and amount of transit extension. Appraisal of existing transit services, fares and operating policies. Blueprint for more effective transit marketing.

86—HEALTH CARE ADMINISTRATION

86.502 Hospital Law and Ethics

2 Q. H.

A study of important legal principles and rulings of importance to medical records administrators, hospital administrative personnel, nurses, and others. Brief introduction to interpersonal ethics in the health-care setting.

86.503 Emergency Procedures and Accident Prevention

2 Q. H.

First aid and the emergency care of injuries and medical emergencies pending the arrival of professional assistance. Emphasis on safety and accident prevention throughout course.

- 86.504, 86.505, 86.506 Foundations of Medical Science I, II, III** 6 Q. H.
Study, primarily through physicians' lectures, of the major disease problems in our society, with an overview of modes of treatment. This course is intended to provide the student who has a non-medical background with some appreciation of the problems faced by the physician in his daily practice, in order to facilitate communication between medical and non-medical members of the health-care team.
- 86.507, 86.508 Medical Terminology** 4 Q. H.
A study of the terminology utilized in the patient-care setting for students without medical or nursing backgrounds. Stems; prefixes; suffixes commonly encountered in hospital and other patient-care activities.
- 86.511 Personal and Community Health** 2 Q. H.
Principles of personal health and healthful living; their application to inter-personal relationships and community life. Discussion of important current health problems.
- 86.521, 86.522 Public Health I, II** 4 Q. H.
Principles of public health, with particular emphasis on the emerging patterns of community organization and activity in the public health field.
- 86.524 Methods and Materials in Public Health Education** 2 Q. H.
An introduction to health education in the public health context.
- 86.541, 86.542, 86.543 Medical Care and Current Social Problems**
Prereq. permission; 6 Q. H.
A seminar on the impact of current social problems on medical care services. Emphasis given will vary with interests and backgrounds of participants, but might include such topics as poverty, drug addiction, and changing standards of morality.
- 86.551, 86.552, 86.553 Organization of the Medical Records Department I, II, III** Prereq. 45.503, 86.556; 6 Q. H.
Principles and practices essential to the effective administration of a medical records service; professional relationships; development of standard procedures. Laboratory practice for proficiency.
- 86.554, 86.555, 86.556 Medical Records Science I, II, III**
Prereq. 80 q.h. credit, incl. 18.326, 86.502; 12 Q. H.
The history of medical records; organization and content of the records; abstracting and preparing reports; storage and preservation of records. Laboratory practice for proficiency.
- 86.557, 86.558 Medical Records Science IV, V** Prereq. 86.556; 8 Q. H.
Analysis and coding of medical records. Procedures in special areas such as radiology, pathology, out-patient departments, and social service. New theories in medical records practice. Laboratory practice for proficiency. Required clinical instruction and practice is correlated with course.
- 86.559 Current Issues in Medical Records Administration**
Prereq. permission; 2 Q. H.
A seminar course for experienced medical records librarians; discusses new problems presented to the medical records administrator by changing patterns of medical care. Registration by prior permission of instructor only.

86.571, 86.572, 86.573 Long-Term Care Administration I, II, III

Prereq. 45.503; 6 Q. H.

The organization of care for the chronically ill and long-term acute patient. Different types of institutions in the field and their relationships to other health facilities and agencies. Case-study approaches to problems of the field. For persons interested in administrative activity in nursing homes or related health facilities.

86.581, 86.582, 86.583 Hospital Organization and Management I, II, III

Prereq. 45.503; 6 Q. H.

The history and development of hospitals. The contemporary American hospital system. Different types of hospital organization. Hospital departments, their functions and interrelationships. New methods of patient care in the hospital setting. Designed for the middle-management or preprofessional hospital administration candidate.

86.589 Basic Nursing for Health Technicians

0 Q. H.

Theory and practice of the basic nursing arts, and skills in Inhalation Therapy practice. (150 clock hours)

86.591, 86.592, 86.593 Introduction to Inhalation Therapy I, II, III

9 Q. H.

Introduction to anatomy, physiology, physics, and orientation in Inhalation Therapy concepts.

86.594, 86.595, 86.596 Procedures in Inhalation Therapy I, II, III

9 Q. H.

Principles and techniques in Inhalation Therapy as they relate to medicine, obstetrics, and pediatric services. Required clinical instruction and practice is correlated with course.

86.597, 86.598, 86.599 Procedures of Inhalation Therapy IV, V, VI

9 Q. H.

Principles and techniques in Inhalation Therapy as they relate to surgery, neurosurgery, and emergency services. Required clinical instruction and practice is correlated with course.

94—LAW ENFORCEMENT

94.501 Administration of Justice

2 Q. H.

The interrelationship of the roles of the judiciary, federal law enforcement agencies, state police, county agencies, and municipal police departments.

94.502 Criminal Law

2 Q. H.

Constitutional consideration; elements of a crime; statutory make-up; the law of arrest; entrapment; criminal responsibility; and defenses.

94.503, 94.504 Evidence and Court Procedure I, II

4 Q. H.

Rules of evidence; principles of exclusion; evaluation and examination of evidence and proof; competency; consideration of witnesses; laws of search and seizure; and court procedure.

94.508, 94.509, 94.510 Criminal Investigation and Case Preparation I, II, III

6 Q. H.

Crime-scene procedure; collection and preservation of evidence; investigative techniques; methods of preparing a case for court.

- 94.514, 94.515 Police Interrogation I, II** 4 Q. H.
The questioning of suspects, witnesses, victims, informants and complainants; laws governing interrogation practices; techniques for legally acceptable interrogation procedures.
- 94.520, 94.521, 94.522 Traffic Law Enforcement I, II, III** 6 Q. H.
Accident prevention and investigation; traffic surveys; selective enforcement; traffic engineering; and traffic safety education.
- 94.525, 94.526, 94.527 Law Enforcement Identification and Records I, II, III** 6 Q. H.
Observation and description; handwriting and typewriter identifications; fingerprinting; records systems and utilization; concentration of theoretical and practical applications.
- 94.530 Police Public Relations** 2 Q. H.
The principles of sound public relations which apply to the entire police operation. Consideration is given to writing; public speaking; radio; television and press relations; press releases; feature stories; news conferences; the police image; public opinion and police public contact.
- 94.531 Police Community Relations** 2 Q. H.
A survey which explores the role and function of the police in inter-group relations; human relations and minority group relations. Emphasis is placed on the responsibilities of the police in dealing with civil rights, civil disorder, riots, and public protection.
- 94.532 Research Methods in Criminal Justice** 2 Q. H.
An opportunity for each student to conduct a research project which must be related to a specific police or correctional interest or operation. The student chooses his research project in consultation with his faculty adviser. The course meets at the discretion of the instructor. The student may consult with his adviser concerning his project at any time. A project paper showing the results of research is required.
- 94.536, 94.537 Police Patrol I, II** 4 Q. H.
The fundamentals of uniformed police foot and vehicular patrol; development of personnel; beat layouts; mechanics of arrest; riot control; stopping methods; and the transportation of prisoners.
- 94.541, 94.542 Introduction to Criminalistics I, II** 4 Q. H.
A survey of the elements of microscopy, spectroscopy and chemistry as they apply to the study of firearms, hair, fibers, blood, paint, tools, glass, documents, laundry marks, poisons and other materials which comprise physical evidence.
- 94.544 The American Correctional System** 2 Q. H.
A critical survey of the correctional field covering probation, institutions and parole with special reference to their historical development, program content and current problems and needs.

- 94.546, 94.547 Social Deviance I, II** 2 Q. H.
Analysis of the social problems of social disorganization, mental disorders, drug addiction, alcoholism, suicide, sexual behavior, world's population crisis, race and ethnic relations, family disorganization, work and automation, poverty and disrepute, war and disarmament.
- 94.549, 94.550 Treatment of Offenders I, II** 4 Q. H.
The concept of punishment and corrections, history of corrections, capital punishment, corporal punishment, imprisonment, juvenile institutions, fines, conditional sentencing and probation, parole, treatment methods, inmate society.
- 94.551, 94.552, 94.553 Correctional Administration I, II, III** 6 Q. H.
Modern management techniques applied to correctional activities concentrating on organizing, planning, directing, controlling and budgeting.
- 94.557 Investigative Report Writing** 2 Q. H.
Interpreting and evaluating information; report content and writing; report analysis with emphasis on practical report-writing projects.
- 94.560 Police Supervision** 2 Q. H.
The police supervisor's role in discipline; interdepartmental relations, problem handling and personnel policies. Problems relating to supervisory relationships, wages, grievances, morale and safety.
- 94.561 Police Juvenile Methods** 2 Q. H.
The role of the police in crime prevention with emphasis on theory, administration, control, treatment, confinement, community resources, relations with the public, and the juvenile court.
- 94.565 Seminar in Delinquency Prevention** 2 or more Q. H.
To be arranged with permission of the instructor.
- 94.567, 94.568, 94.569 Probation and Parole Practices I, II, III** 6 Q. H.
The probation officer, social work and corrections, presentence investigation, conditions of probation and parole, probation worker and the community, effectiveness of probation and parole, administrative aspects, and prediction methods.
- 94.571, 94.572, 94.573 Law Enforcement Management and Planning I, II, III** 6 Q. H.
Modern management techniques applied to police activities concentrating on organizing, planning, directing, controlling and budgeting.
- 94.574, 94.575, 94.576 Juvenile Corrections I, II, III** 6 Q. H.
Juvenile court philosophy, juvenile court procedure, police, detention, petition, hearing, juvenile court terminology, psychologists and psychiatrists, social workers, probation officers, adjudication, juvenile court judges and juvenile institutions, after-care, prevention.

- 94.577, 94.578, 94.579 Government Security Programs I, II, III** 6 Q. H.
 Department of Defense security programs; applicable federal statutes and executive orders; security clearances; handling classified information; visitor control; relations with subcontractors, vendors and suppliers; automatic time-phased downgrading and declassification; and the protection of proprietary information.
- 94.582 Document Control** 2 Q. H.
 A detailed study of the procedures for the handling and control of classified and other sensitive information, including markings, regrading, storage, destruction, and data retrieval. A survey of control systems, extending from manual types to the use of data processing in semi-automated systems.
- 94.583 Industrial Fire Prevention** 2 Q. H.
 The administration of industrial fire prevention programs with emphasis on equipment, engineering, construction, inspections and special hazards.
- 94.584, 94.585 Plant Protection I, II** 4 Q. H.
 The organization, administration and management of plant protection operations.
- 94.586 Retail Security** 2 Q. H.
 The operation of security departments in retail stores of all types with emphasis on functions, honesty shopping, dishonest employees, shoplifters, professional criminals, unions, juveniles, management relations, public relations, special laws, strikes, deliveries, warehouse and mail-order operations, receiving and shipping departments, drug store operations, grocery operations, store detectives, special interrogations, and training.
- 94.590 Seminar in Law Enforcement** 2 or more Q. H.
 To be arranged with permission of and under guidance of the instructor.
- 94.591 Seminar in Industrial Security** 2 Q. H.
 A seminar dealing with current problems facing today's Security Managers as well as studying trends in the profession and an examination of the different fields within the Security vocation. Individual study assignments are given to students to examine such aspects of Security as professionalization, growth patterns, salary structures, training and education, as well as weaknesses in existing Security systems. Students will make field trips to a variety of different types of security functions to obtain material for class discussions and evaluation.
- 94.593 Seminar in Correctional Program Management** 2 Q. H.
 Designed to meet the needs and interests of specific groups of students and administrators and supervisors of correctional programs.

university college faculty

(as of January 2, 1968)

- Richard O. Abbott, B.Arch.
Fine Arts
Architect
- Herbert Abrahms
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Herbert Abrahms, Attorney
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- Henry Adleman, B.S.
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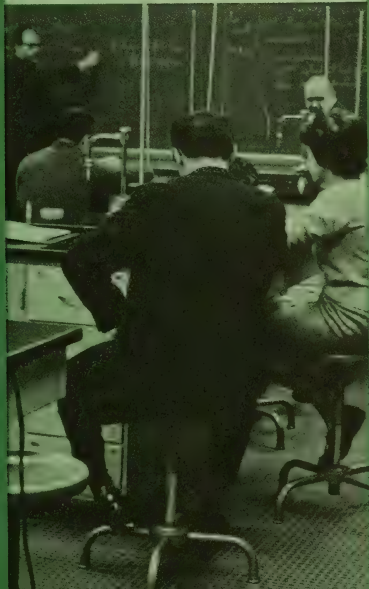




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JUNE 17, 1968 — AUGUST 31, 1968

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Friday 8:30 A.M.-4:30 P.M.

SEPTEMBER 3, 1968 — JUNE 14, 1969

Monday-Friday 8:30 A.M.-8:30 P.M.

Saturdays 8:45 A.M.-12:00 Noon

Office Hours at Suburban Campus, Burlington

Special representatives from the Huntington Avenue Campus will be in attendance during specified dates at registration periods for registration and counseling. Regular office hours at the campus in Burlington are: 8:30 a.m.-10:00 p.m., Monday-Friday, and 8:00 a.m.-1:00 p.m., Saturday. Telephone 272-5500.

Interviews

Prospective students, or those desiring advice or guidance regarding any part of the school work or curricula, are encouraged to arrange for personal interviews. Career planning through competent guidance provides an understanding of professional requirements and develops that definiteness of purpose so vital to success.

Address communications to:

Dean Gustav S. Rook
Lincoln College
Northeastern University
360 Huntington Avenue
Boston, Massachusetts 02115
Telephone 437-2500

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Aims and Scope of the University

Founded in 1898, Northeastern University is incorporated as a privately endowed, nonsectarian institution of higher learning under the General Laws of Massachusetts. The State Legislature by special enactment has given the University general degree-granting powers. The University is governed by a Board of Trustees elected by and from the Northeastern University Corporation, which is composed of more than 150 distinguished business and professional men.

From its beginning Northeastern University has had as its dominant purpose the discovery of community educational needs and the meeting of these in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has sought to pioneer new areas of educational service.

A distinctive feature of Northeastern University is its Cooperative Plan, initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922), Liberal Arts (1935), Education (1953), Pharmacy (1962), Nursing (1964), and Boston-Bouv  College (1964). This educational method enables students to gain valuable practical experience as an integral part of their college programs and also provides the means by which they may contribute substantially to the financing of their education. The Plan has been extended to the graduate level in engineering, mathematics, sociology, actuarial science, the pharmaceutical sciences, and professional accounting.

In the field of adult education, programs of study have been developed to meet a variety of needs. Since 1906 evening curricula have been offered leading to the bachelor's degree. Programs in the arts and sciences, engineering, various fields of business, law enforcement and security, and other areas have been carefully planned to serve mature students who are employed full time during the day and want to broaden their educational background by part-time study. All formal courses of study leading to degrees through evening programs are approved by the Basic College faculties concerned and are subject to the same quantitative and qualitative standards as the regular day curricula.

The following is a brief outline of the aims and scope of the University's programs.

UNDERGRADUATE COLLEGES

BOSTON-BOUVÉ COLLEGE

Boston-Bouvé College offers three major programs of study: physical education and recreation education, both leading to the degree of Bachelor of Science in Education; and physical therapy, leading to the degree of Bachelor of Science in Physical Therapy.

The combined programs of liberal arts, science, and professional preparation include field experience and student teaching, and leadership training in camping and outdoor education at the Warren Center for Physical Education and Recreation in Ashland. In accordance with Northeastern's Cooperative Plan of Education, students are offered varied of preprofessional programs, curricula are normally five years in length and class years.

THE COLLEGE OF BUSINESS ADMINISTRATION

The College of Business Administration offers programs of study in the principal fields of business leading to the degree of Bachelor of Science in Business Administration. These programs are offered on the five-year Cooperative Plan, under which students gain substantial practical experience in the fields for which they are preparing as an integral part of their undergraduate course of study.

The College also sponsors a Management Institute which offers various special courses for business and industrial executives. One phase of the Institute's work is carried on by the Center for Management Development, which annually conducts an intensive program designed to provide professional growth for middle-management executives who will ultimately be called upon to carry broader executive responsibilities. The plan of instruction, based on a modification of the Northeastern Cooperative Program, permits the participants to maintain their job responsibilities during the six-month period of the course. The Management Development Program is conducted at Andover, Massachusetts, on the campus of Andover Academy.

A Bureau of Business and Economic Research, concerned particularly with problems of the New England region, is an integral part of the College. The Bureau conducts research projects under faculty leadership using undergraduate and graduate cooperative students as research assistants.

COLLEGE OF CRIMINAL JUSTICE

The College of Criminal Justice offers full-time day curricula on the Cooperative Plan leading to the degree of Bachelor of Arts with concentration in the field of law enforcement.

THE COLLEGE OF EDUCATION

The College of Education offers programs leading to the degree of Bachelor of Science in Education. These are designed particularly to meet the

needs of high school graduates who desire to prepare themselves for teaching or administrative positions in elementary and secondary schools. Curricula are offered on the five-year Cooperative Plan, which provides for employment in libraries, social service agencies, and school systems.

THE COLLEGE OF ENGINEERING

The College of Engineering offers five-year cooperative curricula in civil, mechanical, electrical, chemical, industrial, and biomedical engineering leading to the degree of Bachelor of Science with specification according to the engineering department in which the student qualifies. A six-year program in power systems engineering in collaboration with public utilities leads to both the bachelor's and master's degree in electrical engineering. The College also offers during evening hours a part-time program leading to the degree of Bachelor of Science in Electrical Engineering. This program extends over eight years, covers the identical courses given in the day cooperative curriculum, and meets the same qualitative and quantitative standards of scholarship.

THE COLLEGE OF LIBERAL ARTS

The College of Liberal Arts offers majors in the usual fields of the arts and sciences leading to the degree of Bachelor of Arts. With the exception opportunities for alternate terms of work-study experience during upper-operated on the Cooperative Plan.

LINCOLN COLLEGE

Lincoln College offers technology programs leading to the Associate in Engineering and Bachelor of Engineering Technology degrees. It also offers science technology and paramedical technology programs leading to the Associate in Science degree.

In addition to its traditional curricula, Lincoln College offers interdisciplinary and certificate programs providing technological and professional development opportunities to meet the special needs of part-time students.

THE COLLEGE OF NURSING

The College of Nursing offers two separate and distinct programs of study, both organized on the Cooperative Plan:

- (a) A three-year curriculum in preparation for the R.N. Examinations and leading to the Associate in Science degree.
- (b) A five-year curriculum also preparing students for the R.N. Examinations, and leading to the degree of Bachelor of Science in Nursing.

Five of Boston's leading hospitals — Beth Israel, Children's Hospital Medical Center, New England Deaconess, Peter Bent Brigham, and Massachusetts General — collaborate with Northeastern by providing suitable cooperative work opportunities during the upper-class years of these programs.

THE COLLEGE OF PHARMACY

The College of Pharmacy offers five-year cooperative curricula leading to the degree of Bachelor Science in Pharmacy. Cooperative placement begins with the sophomore year and continues for three years, the senior year being devoted to full-time study at the University.

UNIVERSITY COLLEGE

University College, so called because it draws upon the resources of the other colleges of the University, offers courses of study leading to certificates, Associate in Science and Bachelor of Science degrees. University College offers both day and evening programs designed specifically to meet the needs of adult students who wish to undertake part-time curricula during late afternoon or evening hours and on Saturdays. In cooperation with the Forsyth School for Dental Hygienists, University College offers a two-year day curriculum leading to the Associate in Science degree.

Quality standards of instruction and requirements for the degrees offered by University College are wholly consistent with those of the other colleges of the University. University College does not duplicate the offerings of the eight Basic Colleges but provides curricula which cut across traditional subject-matter areas to meet the particular needs of adults desiring formal programs of professional development on a part-time basis, or of young people enrolled in professional schools affiliated with Northeastern University.

GRADUATE SCHOOLS

ACTUARIAL SCIENCE

Master of Science in Actuarial Science.

ARTS AND SCIENCES

Master of Arts, Master of Science, Doctor of Philosophy.

BUSINESS ADMINISTRATION

Master of Business Administration.

EDUCATION

Master of Education.

ENGINEERING

Master of Science with course specification, including a special six-year program in power systems engineering leading to both bachelor's and master's degrees in electrical engineering; a similar six-year program in mechanical engineering leading to both bachelor's and master's degrees; and Doctor of Philosophy degree in the fields of electrical, chemical, and mechanical engineering.

LAW

Juris Doctor.

PHARMACEUTICAL SCIENCES

Master of Science with specialization in hospital pharmacy, industrial pharmacy, medicinal chemistry, and pharmacology.

PROFESSIONAL ACCOUNTING

A five-quarter curriculum leading to the degree of Master of Science in Accounting.

Some of these programs are offered on the Cooperative Plan; others provide teaching and research fellowships for able candidates. Administrative headquarters for all graduate programs are located in the Churchill Hall.

CENTER FOR CONTINUING EDUCATION

The Center for Continuing Education was established to relate the University to the needs of its community in a period of accelerated change. Its programs are composed of seminars, conferences, institutes, forums, and a wide variety of special courses designed to serve specific needs. The Division of Special Programs, working cooperatively with trade associations and professional societies, offers a wide variety of programs dealing with current needs and problems. Through its Division of Community Services, working with governmental agencies and community organizations, the Center is becoming increasingly involved in social problems on both the local and national level.

Many of these programs are conducted at Henderson House, Northeastern University's conference center in Weston, Massachusetts.

DAY PROGRAMS FOR ADULTS

These programs were developed to meet the needs of adults who wish to engage in part-time study during the day only. Non-credit courses and undergraduate and graduate degree programs are offered at the Boston and Burlington campuses. Included are courses from the Graduate School of Education, the Graduate School of Arts and Sciences, University College, and the Center for Continuing Education. A Human Relations and Adult Counseling Program is also offered.

AFFILIATED PROGRAMS

FOR DENTAL HYGIENISTS

The Forsyth School for Dental Hygienists conducts a two-year program of dental hygiene education and general education in cooperation with Northeastern University. Graduates of the program receive the Certificate in Dental Hygiene from Forsyth and the degree of Associate in Science from Northeastern.

FOR MEDICAL TECHNOLOGISTS

In cooperation with the New England Baptist and the New England Deaconess Hospitals, Northeastern University offers a full-time day program on the Cooperative Plan leading to the degree of Bachelor of Arts.

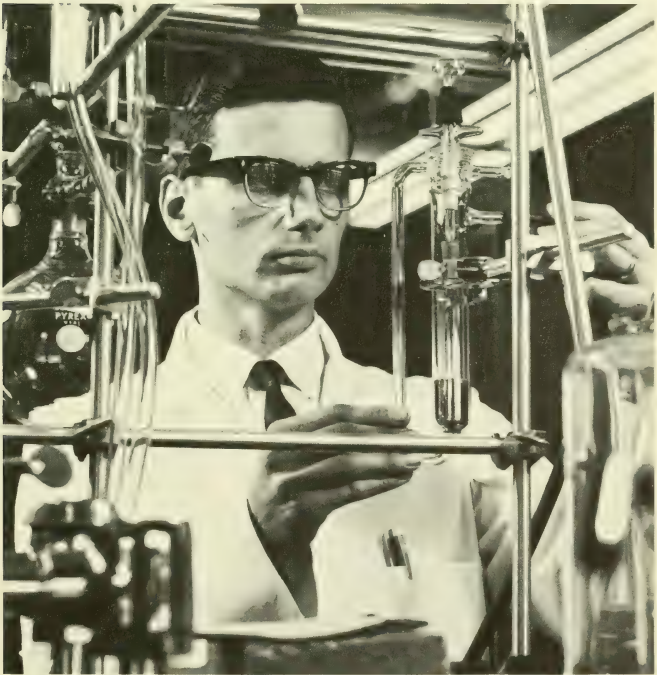
FOR NURSES

Northeastern University offers instruction in the sciences, humanities, and social studies for student nurses from the New England Deaconess and Children's Hospital Medical Center Schools of Nursing.

RESEARCH ACTIVITIES

The faculties of the University are engaged in a wide variety of basic research projects in business, science, social science, pharmacy, and engineering. These are coordinated by the Dean of Research, whose services are University-wide and available to the faculties of all the Colleges.

Although Northeastern is primarily concerned with undergraduate and graduate instruction, the University believes that the most effective teaching and learning takes place in an environment characterized by research activities directed toward extending the frontiers of knowledge.





Buildings and Facilities

LOCATION OF MAIN CAMPUS

The main campus of Northeastern University is located at 360 Huntington Avenue in the Back Bay section of Boston. Many of the city's famous cultural, educational, and philanthropic institutions are situated in the Back Bay, including the Museum of Fine Arts, Symphony Hall, Horticultural Hall, the Isabella Stewart Gardner Museum, the Harvard teaching hospitals, and many schools and colleges. Most are within walking distance of Northeastern University.

Major transportation facilities serving the Boston area are Logan International Airport, two rail terminals, bus terminals serving inter- and intra-state lines, and MBTA subway-bus service within the metropolitan-suburban area. There is a subway stop in front of the campus. For motorists, the best routes to the campus are the Massachusetts Turnpike (Exit 22) and Route 9, of which Huntington Avenue is the intown section.

The campus of 47 acres is divided by Huntington Avenue, with the main educational buildings on one side and dormitories on the other. The principal buildings, all of which have been constructed since 1938, are of glazed brick in contemporary classic style. Most are interconnected by underground passageways.

CARL S. ELL STUDENT CENTER

The Carl S. Ell Student Center provides facilities for student recreation and for extracurricular activities. The Alumni Auditorium, with a seating capacity of 1,300, is part of the Center. Also included are special drama facilities, a ballroom, main lounge, fine arts exhibition area, student offices, conference rooms, and a dining area seating more than 1,000.

THE UNIVERSITY LIBRARY

The Dodge Library is the main library on the Boston campus and maintains an open-stack system. Bound volumes in the library system exceed 190,000, and microfilm titles, 250,000. Collections are located in these areas:

1. The General Collection in the book stacks as indicated by the classification number given in the upper left corner of the catalog card.
2. The Reference Collection in the Cabot Reading Room to the left of the Circulation Desk, which includes bibliographies, government documents, maps, company publications, the information file, association publications, and theses.
3. The Periodical Collection on the basement level occupying the lower Reading Room and the first two back-stack levels.
4. The Reserve Book Collection adjacent to the Periodical Room on the basement level.
5. The Foreign Literature Collections in the Webster Reading Room to the right of the Circulation Desk.
6. The Audio Facility consisting of sound recordings and magnetic tapes for instructional and individual use in the Richardson Room on the second floor. The Fine Arts and Education Collections are also located here.
7. The American and English Literature Collections in the new Literature Reading Room.
8. The Humanities Collection (Philosophy, Psychology, Religion) in Rooms 202 and 203.
9. The Microtext Collection housed on the basement level adjacent to the periodical room. This collection includes 300,000 titles in micro-print, microfilm, and microfiche forms.
10. Directly behind the Circulation Area, the subject areas of Pure and Applied Science and the History Collection are located on the third- and fourth-stack levels.

The Card Catalog is a union list of materials in the University Library and is located in the Webster Reading Room.

The Circulation Department has an IBM card file of all students attending the University. To borrow materials, students should present university identification at the Circulation Desk. For extensive research, where it is not possible for the University Library to acquire materials, the inter-library loan system allows the acquisition of items from other collections throughout the country.

Library Hours — Boston Campus

Monday — Thursday	7:45 a.m. to 10:00 p.m.*
Friday	7:45 a.m. to 7:30 p.m.*
Saturday	8:30 a.m. to 4:00 p.m.
Sunday	1:00 p.m. to 10:00 p.m.*

The only days in the year that the Library is closed are Thanksgiving and Christmas.

Library Hours — Suburban Campus, Burlington

Monday — Friday	8:30 a.m. to 9:00 p.m.
Saturday	8:30 a.m. to 1:00 p.m.

The University Library System includes two libraries in the Division of Research. Physics—Electrical Engineering is housed in 325 Dana Research Center and Chemistry—Mathematics is housed on the fifth floor of the United Realty Building.

SUBURBAN CAMPUS

The Suburban Campus, located near the junction of Routes 128 and 3 in Burlington, Massachusetts, was established to meet the needs of individuals and of industry in the area.

In addition to graduate courses in engineering, physics, mathematics, business administration, science, education, and the arts, portions of undergraduate programs leading to the associate and bachelor's degrees, special programs for adults, and non-credit state-of-the-art programs are offered.

HENDERSON HOUSE

The University's conference center, Henderson House, is located in Weston, Massachusetts. The Center for Continuing Education conducts short-term courses, seminars, and special institutes for business, professional, and research groups. Henderson House is 12 miles from the main campus.

WARREN CENTER

The Warren Center for Physical Education and Recreation in Ashland, Massachusetts, serves as a year-round outdoor laboratory for students in Boston-Bouvé College. There are facilities for conferences, special education in arts and crafts, and sports, including aquatics. Buildings include a lodge, cottages, and an infirmary.

MARINE SCIENCE INSTITUTE

The Marine Science Institute at Nahant, Massachusetts, about 20 miles northeast of Boston, is a research and instruction facility primarily engaged in studies of marine biology and oceanography. The Institute is operated the year around.

*On these days the following reading rooms are open until 1 a.m., and during examination periods they are open 24 hours a day: Reference, Richardson, Literature, Humanities.

Calendar

1968

Registration for Fall Quarter

Boston		
Former Students . . .	5:30- 8:30 p.m.	September 3-6
	9:00-12:00 noon	September 7
New Students	5:30- 8:30 p.m.	September 9-13
Burlington	12:00- 8:30 p.m.	August 29
	5:30- 8:30 p.m.	September 4 and 6
Framingham	5:30- 8:30 p.m.	September 9 and 11
Lynn	5:30- 8:30 p.m.	September 10 and 12
Weymouth	5:30- 8:30 p.m.	September 3 and 5
Fall Quarter begins		September 16
Columbus Day — no classes		October 12
Veterans' Day — no classes		November 11
Thanksgiving Day		November 28
Final Exam Period for Fall Quarter		December 2-7
Registration for Winter Quarter		
Boston	5:30- 8:30 p.m.	December 2-6
Burlington	5:30- 8:30 p.m.	December 3
Framingham	5:30- 8:30 p.m.	December 4
Lynn	5:30- 8:30 p.m.	December 6
Weymouth	5:30- 8:30 p.m.	December 5
Winter Quarter begins		December 9
Christmas Recess		December 23-January 1

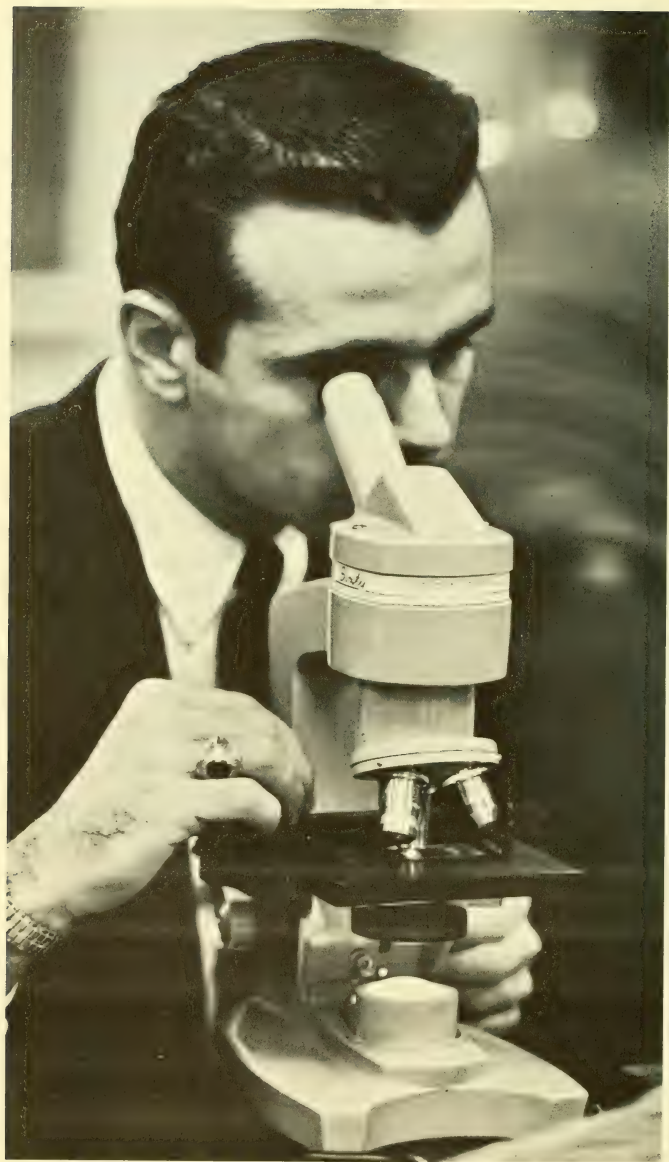
1969

Classes Resume		January 2
Washington's Birthday — no classes		February 22
Final Exam Period for Winter Quarter		March 3-8
Registration for Spring Quarter		
Boston	5:30- 8:30 p.m.	March 3-7
Burlington	5:30- 8:30 p.m.	March 4



CALENDAR / 25

Framingham	5:30- 8:30 p.m.	March 5
Lynn	5:30- 8:30 p.m.	March 7
Weymouth	5:30- 8:30 p.m.	March 6
Spring Quarter begins		March 10
Spring Recess		March 10-15
Classes begin		March 17
Patriots' Day — no classes		April 19
Memorial Day — no classes		May 30
Final Exam Period for Spring Quarter		June 2-7
Commencement		June 15
Registration for Entire Summer Quarter		
Boston	5:30- 8:30 p.m.	June 9-13
Burlington	12:00- 8:30 p.m.	June 10
Registration for Summer Quarter II		
Boston	5:30- 8:30 p.m.	July 14 and 15
Burlington	5:30- 8:30 p.m.	July 14 and 15
Registration for Summer Quarter B (six weeks)		
Boston	12:00- 8:30 p.m.	July 28
Registration for Summer Quarter III		
Boston	5:30- 8:30 p.m.	August 11 and 12
Burlington	5:30- 8:30 p.m.	August 11 and 12
Summer Quarter I		June 16-July 11
Summer Quarter II		July 14-August 8
Summer Quarter III		August 11-September 5
Summer Quarter A		June 16-July 24
Summer Quarter B		July 28-September 5



The Role and Scope of Lincoln College

PURPOSE

Lincoln College is charged with the responsibility for developing and offering college-level courses and curricula of an applied-science or technological nature to meet community needs for professional personnel qualified to deal with the applications and uses of the biological, natural, and physical sciences. The programs of study conducted by the College have in common the following purposes and characteristics:

1. The programs of instruction prepare the graduate for activities allied to the fields of engineering, science or medicine, but are more specialized than those required to prepare a person for full professional responsibilities.
2. The programs of instruction are more concise and more completely technological in content than professional curricula, though they are concerned with the same general fields of scientific, engineering, industrial, or clinical specialization.
3. The programs of instruction are essentially technological in nature, based upon principles of science, and include post-secondary-school mathematics to provide the tools to achieve the technological objectives of the curricula.
4. Emphasis is placed upon the use of rational processes in converting theories and ideas into practical techniques, procedures, and products.
5. Extensive training for artisanship or craftsmanship is not included within the scope of the technological education programs.
6. Graduates from the associate degree programs **do** have opportunities for educational work leading to the Bachelor of Engineering Technology degree or the Bachelor of Science degree in related technology programs.

TECHNOLOGY AND THE TECHNOLOGIST

Scientific and technological complexity ranges over a very broad spectrum extending all the way from extremely simple craftsmanlike activity to highly complex and abstract activity. At one end is the **professional** whose work is mostly mental in character. He studies, reasons and visualizes how new knowledge may be used in the development of solutions to technical problems. Usually he is not completely knowledgeable of the detailed procedures used by the **skilled craftsman** who executes the ideas, procedures and designs.

The **technologist** is the pivot-man on the professional-technologist-craftsman team. He works with the professional engineer, scientist, doctor, supervisor and craftsman in converting knowledge of scientific theories and practical craftsmanship into products, procedures and techniques. His responsibilities are technologically important — professional opportunities are limited only by ambition, ability, and education.

When employed in research, design or development, the technologist usually acts as direct supporting personnel to the professionals. If he functions in a capacity related to production, operation, testing or control, he usually follows a course prescribed by a professional but may not work closely under his direction. If installation, maintenance or sales are his areas of responsibility, he is frequently performing a task that would otherwise have to be performed by the professional. He thereby assumes the more routine professional functions demanded by our increasingly scientific and technical society.

In executing his functions the technologist is required to use a high degree of rational thinking, to employ post-secondary school mathematics and the principles of the biological, natural and physical sciences. The skilled technologist works with his mind as well as his hands. He considers why things work as well as how things work. To perform his functions efficiently, the technologist must effectively communicate technical and scientific information mathematically, graphically and linguistically.

THE NEED FOR TECHNOLOGISTS

Our present technological age, with its exploding accumulation of new information and discoveries in the physical, natural and life sciences, has increased the need for people with specialized training in science and technology. Experts have recently estimated that in order to meet expanding needs, the number of students graduating from the nation's professional schools must double — a goal which is improbable in the near future.

The most reasonable alternative is to make our professional manpower most efficient by providing assistance in the form of specially trained technologists. Manpower experts believe that the present ratio of less than one technologist to each professional should ideally be nearer five to one.

Opportunities for technologists are increasing at a faster rate than for any other occupational group — a 50 per cent increase is expected in the next five years. More than 100,000 technologists will be needed each year, whereas schools now graduate only 25,000 per year. The technologist's employment opportunities are varied and much demanded in health and public service organizations; atomic energy and electric power industries; metal fabricating industries; local, state and federal government agencies; the armed forces; aerospace industries; chemical, petroleum, plastics and metal industries, as well as transportation and communication industries.

TECHNOLOGY PROGRAMS

Recognizing the need for technologists and their expanding role in modern society, Lincoln College offers engineering technology programs leading to the Associate in Engineering and Bachelor of Engineering Technology degrees; science technology and allied-medical technology programs leading to the Associate in Science degree; and collaborates with University College in industrial technology and medical technology programs leading to the Bachelor of Science degree. In addition to the more traditional programs, Lincoln College offers interdisciplinary programs combining instruction in closely allied fields and also certificate programs which meet special needs.

Lincoln College offers programs in Civil Engineering Technology, Control Systems Technology, Electrical Engineering Technology, Industrial Technology, Mechanical Engineering Technology, Medical Technology, and Science Technology.

PROGRAMS OF STUDY

The major technological fields encompassed by Lincoln College and Lincoln College–University College programs are:

FOUNDATIONS FOR TECHNOLOGY

Introductory Mathematics, Physics and Chemistry
(non-credit) page 53
Reading-Improvement Program (non-credit) page 53
Programmed Instruction Review Courses (non-credit) page 53

SCIENCE TECHNOLOGY

Chemical–Biological Technology (A.S. degree) page 56
Chemical–Physical Technology (A.S. degree) page 57
Mathematical–Physical Technology (A.S. degree) page 59
Chemical–Biological Technology (B.S. degree) pages 60-61

ALLIED-MEDICAL TECHNOLOGY

Bioelectronic Engineering Technology (A.E. degree) page 63
Cytotechnology (B.S. degree) pages 64-65
Medical Technology (B.S. degree) pages 66-67

CIVIL ENGINEERING TECHNOLOGY

Municipal and Sanitary Engineering Technology
A.E. degree) page 69
Structural Engineering Technology (A.E. degree) page 70
Surveying and Transportation Engineering Technology
(A.E. degree) page 71
Civil Engineering Technology (B.E.T. degree) pages 72-73
Mechanical–Structural Engineering Technology
(B.E.T. degree) pages 74-75

MECHANICAL ENGINEERING TECHNOLOGY

Mechanical Engineering Technology (A.E. degree) page 78
Heat Engineering Technology (A.E. degree) page 79
Mechanical Engineering Technology (B.E.T. degree) pages 80-81
Mechanical–Structural Engineering Technology
(B.E.T. degree) pages 82-83

ELECTRICAL ENGINEERING TECHNOLOGY

Bioelectronic Engineering Technology (A.E. degree) page 86
Electrical Power Engineering Technology (A.E. degree) page 87
Electronics Engineering Technology (A.E. degree) page 88
Control Systems Engineering Technology (Certificate) page 89
Electrical Engineering Technology (B.E.T. degree) pages 90-91

INDUSTRIAL TECHNOLOGY

Industrial Technology (B.S. degree) page 93

General Admissions Information

STUDENT BODY

The student body of Lincoln College is composed of mature men and women pursuing academic programs with an earnestness of purpose which gives promise of success in their educational and professional careers. Most students are employed in industry with vocational experience ranging from very little for the recent secondary school graduate to as much as 20 or 30 years for individuals seeking increased professional responsibility and status. Many technical career categories are represented — industrial, engineering, scientific, and allied-medical — demonstrating that, in our increasingly complex society, the key to personal advancement is education.

ADMISSIONS COUNSELING

Career planning through self-analysis and competent counseling provides an understanding of professional requirements and assists students in planning educational programs appropriate to their objectives. Prospective students are encouraged to arrange for personal interviews with the Lincoln College staff of program counselors for assistance in planning their academic programs. Counselors are available by appointment at the Huntington Avenue Campus, Boston; the Suburban Campus, Burlington; the North High School, Framingham; the Weymouth High School or Annex, Weymouth; and the Lynn English High School, Lynn. When records of prior education and training are available, the effectiveness of the counseling review is greatly enhanced. The University, through its Counseling and Testing Center and its Career Information Center, is also prepared to assist applicants whose educational and vocational goals are more complex or less firmly defined.

APPLICATION FOR ADMISSION

Applications for the programs of study offered in the Lincoln College are accepted for admission to the Fall (September), Winter (December),

Spring (March) and Summer (June) quarters. Applications should be filed as early as possible in advance of the opening of each quarter in order that eligibility and status may be established.

Information concerning admission may be obtained either by writing to Lincoln College or by requesting it at the time of visiting the College. The application for admission should be filled out in ink, properly signed and submitted to Lincoln College, Northeastern University, Boston, Massachusetts 02115.

CLASSIFICATION OF STUDENTS

Applicants whose credentials are approved by the Lincoln College Committee on Admissions are admitted as: (1) Regular Students, (2) Conditioned Students, or (3) Special Students.

Regular Students. Applicants presenting evidence of completion of an approved secondary school course, or the equivalent of 15 units (including one each in Algebra and Plane Geometry), may be admitted as regular students and candidates for the Associate in Science, Associate in Engineering, or Bachelor of Engineering Technology degree.

Conditioned Students. Applicants who do not meet the full requirements for admission as regular students may, at the discretion of the Committee on Admissions, be admitted as conditioned students provided the secondary school work embraces one unit each of Algebra and Plane Geometry. A candidate deficient in Algebra and/or Plane Geometry will be classified as a "conditioned student." He must complete 10.301 and 10.302, Introductory Mathematics, before registering for the first-year program and being reclassified as a "regular student."

A conditioned student whose scholarship is satisfactory but who has not removed his conditions within the time limit specified by the Committee on Admissions may be permitted to continue his program of studies, but on completion of the curriculum will receive a diploma indicating completion of the program, but not carrying the award of a degree.

Every conditioned student must petition the Committee on Education for reclassification.

Special Students. Applicants wishing to pursue a single course or individualized programs may be admitted as special students, not candidates for a degree, provided their previous education and training are the equivalent of the prerequisites for the courses in which they wish to enroll.

Programs may be planned to meet individual needs to provide rapid and immediate knowledge of certain disciplines, to supplement previous training, or to obtain preparation permitting entrance into a new line of endeavor.

ACADEMIC BACKGROUND

A firm knowledge of the fundamentals of mathematics and science is the foundation upon which successful achievements in the more advanced technological courses are built.

Applicants to Lincoln College are, in many cases, mature adults who, although they have firm backgrounds in industry or previous education, have been away from formal study for some time and, therefore, have doubts concerning their study habits and their algebra, geometry and science proficiency. Those who anticipate some difficulty in adjusting to the first-year course requirements are advised to give very serious consideration to enrolling in non-credit courses in Introductory Mathematics, Introductory Physics, and/or Introductory Chemistry. These courses are designed to develop appropriate background for the basic courses in the degree programs.

MATHEMATICS PLACEMENT TEST

Applicants requesting admission to regular first-year mathematics are required to demonstrate satisfactory proficiency in Introductory Mathematics through the Lincoln College Mathematics Placement Test. Students who request enrollment in the non-credit Introductory Mathematics course are not required to take the test. The Mathematics Placement Test will be administered during the registration period for each term of instruction at the Huntington Avenue Campus, Boston; the Suburban Campus, Burlington; the North High School, Framingham; the Weymouth High School or Annex, Weymouth; and the Lynn English High School, Lynn.

Students who demonstrate satisfactory proficiency in the test will be assigned to the prescribed first-year mathematics sequence. The student may complete his schedule of courses by enrolling in Physics, General Chemistry or Engineering Graphics as his degree program requires.

If need for a strengthening of mathematical background is indicated, the applicant will be assigned to the Introductory Mathematics course. Students enrolling in Introductory Mathematics may fill out their schedule by enrolling in Introductory Physics, Introductory Chemistry, Engineering Graphics or General Chemistry.

In every case the student should carefully consider his combined work and study load and register only for those courses which contribute to the development of a firm knowledge of fundamentals and which enable him to adjust to academic study requirements.

TRANSFER STUDENTS AND ADVANCED STANDING CREDITS

Students admitted with transfer or advanced standing credits from another institution must meet the requirements for admission as set forth under the regulations applicable to regular students. Advanced standing in the Lincoln College may be obtained by (1) Transfer of Credits or (2) Proficiency Examination.

Transfer of Credits. Subject to the approval of the Committee on Admissions, credits may be awarded for academic work completed in other approved schools, colleges or universities if the following criteria are met: (a) the content of the course being submitted is equivalent to that of the corresponding course in the Lincoln College; (b) the average grade achieved in

the course submitted is "C" or higher, and (c) the remoteness of the time of study does not negate its use as a prerequisite for an advanced course.

Applicants desiring advanced standing credit by transfer should indicate this desire at the time of filing the application for admission. The applicant should request the Registrar of the institutions of previous attendance to mail an official transcript to the Lincoln College.

Proficiency Examinations. Applicants who do not meet all the criteria for the normal transfer of credits but who are able to supply evidence of sufficient knowledge of a subject as a result of previous training or experience may petition the Committee on Admissions for the privilege of taking a Proficiency Examination. If satisfactory proficiency is indicated by the examination, advanced standing credits may be awarded or a substitute course may be recommended.

Readmission. Former students, who seek readmission to continue a program of study after having withdrawn from the College for a period of time, may be required to repeat courses which are prerequisites to advanced work.



General Registration Information

REGISTRATION FOR COURSES

Completion of admission requirements does not constitute official registration for courses. All students must be properly registered before attending classes. Registrations are processed by the Registrar's Office during the official registration periods. Former students should ascertain completion of prerequisite courses before registration. Students may register for full-year sequences of courses during the official registration periods. They are urged to register as early as possible in order to obtain the desired class schedule.

PROGRAM CHANGES

Changes in program should be initiated before the opening day of classes.

OFFICIAL REGISTRATION PERIODS

Official registration periods are scheduled before the Fall, Winter, Spring and Summer quarters during the academic year. Students are urged to register as early as possible during these periods.

The official dates and times of registration are as follows:

1968

FALL QUARTER REGISTRATION PERIOD

Boston		
Former students	5:30- 8:30 p.m.	September 3-6
	9:00-12:00 noon	September 7
New students	5:30- 8:30 p.m.	September 9-13
Burlington	12:00- 8:30 p.m.	August 29
	5:30- 8:30 p.m.	September 4-6
Framingham	5:30- 8:30 p.m.	September 5, 6, 7
Lynn	5:30- 8:30 p.m.	September 10 and 12
Weymouth	5:30- 8:30 p.m.	September 3 and 5

WINTER QUARTER REGISTRATION PERIOD

Boston	5:30- 8:30 p.m.	December 2-6
Burlington	5:30- 8:30 p.m.	December 3
Framingham	5:30- 8:30 p.m.	December 4
Lynn	5:30- 8:30 p.m.	December 6
Weymouth	5:30- 8:30 p.m.	December 5

1969

SPRING QUARTER REGISTRATION PERIOD

Boston	5:30- 8:30 p.m.	March 3-7
Burlington	5:30- 8:30 p.m.	March 4
Framingham	5:30- 8:30 p.m.	March 5
Lynn	5:30- 8:30 p.m.	March 7
Weymouth	5:30- 8:30 p.m.	March 6

SUMMER QUARTER REGISTRATION PERIOD

Entire Summer Quarter		
Boston	5:30- 8:30 p.m.	June 9-13
Burlington	12:00- 8:30 p.m.	June 10
Summer Quarter II		
Boston	5:30- 8:30 p.m.	July 14 and 15
Burlington	5:30- 8:30 p.m.	July 14 and 15
Summer Quarter B (six weeks)		
Boston	12:00- 8:30 p.m.	July 28
Summer Quarter III		
Boston	5:30- 8:30 p.m.	August 11 and 12
Burlington	5:30- 8:30 p.m.	August 11 and 12

General Academic Information

CAMPUSES

All courses are offered at the Huntington Avenue Campus, Boston, with a limited number of courses available at the Suburban Campus, Burlington, and at North High School, Framingham; Lynn English High School, Lynn; Weymouth High School or Annex, Weymouth.

THE QUARTER CALENDAR

The regular school year, from September to June, is divided into three quarters of 13 weeks each. Twelve weeks are scheduled for instruction and final examinations with one week available for make-up classes or vacation time. A limited program of courses is offered during the summer quarter.

LIBRARY AND OTHER STUDY AREAS

The UNIVERSITY LIBRARY is well equipped with technical literature. A detailed statement about its facilities and hours appears on pages 22 and 23.

The privilege of obtaining books from the Boston Public Library is extended to students of Lincoln College. Application for this privilege, which involves a fee, should be made directly to the Boston Public Library.

Additional study areas are available in the EII Student Center Building.

INSTRUCTION

Class Sessions. At the Huntington Avenue Campus, lecture periods consist of one hour and forty-minute sessions beginning at about 6:30 p.m. or 8:15 p.m. each weekday and at 9:00 a.m. or 11:00 a.m. on Saturdays. At the Suburban Campus, Burlington; North High School, Framingham; Weymouth High School, Weymouth; and Lynn English High School, Lynn; lecture periods begin at 6 or 8 o'clock each evening. Design and laboratory courses are of longer duration and may occupy a full evening.

Regular Course Work. All of the usual methods of instruction are employed — lectures, home assignments, class projects, laboratory work, irregularly scheduled quizzes, and formal examinations. In addition, mid-course examinations are scheduled in most courses and a final examination is required at the completion of all courses. Students are responsible for fulfilling all the requirements of a course. In the event of absence, students must make appropriate arrangements for makeup with the instructor. Students must follow the procedures outlined below for makeup of missed mid-term or final examinations.

ATTENDANCE

Students absent from regularly scheduled sessions in any subject, for whatever reason, may seriously jeopardize their academic progress and status. Students are expected to be in attendance at all the sessions scheduled in their courses. Excessive absence may be sufficient cause for the Registrar to remove the subject(s) from the student's schedule.

WITHDRAWAL

Simply ceasing to attend classes or notifying the instructor does not constitute official withdrawal from a course. To withdraw officially from a course, the student must notify the Registrar's Office and complete the appropriate withdrawal form. Properly registered students who do not attend the first or second session in any course may be automatically withdrawn from the class roll. (See page 44 for Refund of Tuition statement.)

MAKEUP EXAMINATIONS

Mid-Course Examinations. A student absent from a regularly scheduled mid-course examination may petition for a makeup examination. This is a privilege which may be denied if abused by an excessive number of petitions or for other reasons.

Students applying for makeup examinations must observe the following procedure:

1. Obtain a petition from the Lincoln College Office.
2. Complete it in detail and pay the required Makeup Examination Fee of \$3 at the Bursar's Office.
3. File the original petition in the Lincoln College Office and retain countersigned student's copy.

Makeup mid-term examinations will be given on a Saturday at 1:00 p.m. in a designated room.

Petitions must be filed in accordance with the schedule listed below:

Examination Missed During	File Petition No Later Than	Date Scheduled
Fall Quarter	Nov. 9, 1968	Nov. 23, 1968
Winter Quarter	Feb. 8, 1969	Mar. 1, 1969
Spring Quarter	May 10, 1969	May 24, 1969

In the event that an absence from a mid-term examination is known in advance, a petition may be filed beforehand. No petition will be accepted for any reason after the dates specified.

Any student who does not take the makeup examination as scheduled will forfeit the makeup privilege.

Final Examinations. If a student is absent from a final examination, he will receive a grade of "I" (Incomplete) in the course. He may petition for a makeup final examination at the Registrar's Office, 120 Hayden Hall.

The student must pay a fee of \$5 at the time the petition is filed with the Registrar for taking the special final examination. Petitions for makeup final examinations must be filed in accordance with the schedule listed below:

Final Examination Missed During	File Petition No Later Than	Makeup Final Examination During Week of
Fall Quarter	Dec. 21, 1968	Jan. 13, 1969
Winter Quarter	Mar. 29, 1969	April 21, 1969
Spring Quarter	June 28, 1968	July 21, 1969
Summer Quarter	Sept. 27, 1969	Oct. 20, 1969

Students will be notified by mail when and where to take the missed final examination. All makeup examinations will be given on the Boston Campus. Students who do not take makeup final examinations as scheduled forfeit the makeup privilege.

GRADING SYSTEM

The following system of grading is used. The numerical equivalent for each grade is in parentheses.

A (4.0) — Outstanding	D (1.0) — Poor
B (3.0) — Good	F (0.0) — Failure
C (2.0) — Satisfactory	I (—) — Incomplete

A general average of "D" is unacceptable and will not allow a student to continue in Lincoln College or to receive a degree from Northeastern University. The "F" grade is a definite failure and requires repetition of course in its entirety. The "I" grade is given only when the student fails to take the final examination.

GRADE REPORTS

A report of the student's standing is issued at the end of each quarter. Grades are mailed to the student by the Registrar and will not be given out at the office of either the Registrar or Lincoln College. Under no circumstances will grades be given over the telephone.

ACADEMIC STANDARDS

The student is required to maintain an appropriate quality-point average in course work and to complete the quantitative-credit requirements of his program of study to satisfy academic progress criteria and achieve graduation from Lincoln College.

Quality-Point Average. The quality points earned by the student in a given course are determined on the basis of the letter-grade achieved and the number of credit hours carried by the course. The total quality points earned divided by the total number of credit hours constitute the quality-point average.

- 1. When the student has more than one grade in the same course, the most recent grade will be used in the calculation of the quality-point average.
- 2. A grade of "I" will not be considered in the calculation of the final quality-point average.
- 3. Although advanced standing credits (ASC) allowed for acceptable work completed at other institutions by transfer students count toward completion of the quantitative credit requirements, neither the credits nor the grades earned in such courses are included in quality-point average computations.

For example, a student who has registered for seven courses, cleared a failure in one of them and received advanced standing credit (ASC) in another, may calculate his quality-point average as follows:

Grade Achieved	Numerical Equivalent	Credit Hours	Quality Points
A	4.0	× 4	= 16.0
B	3.0	× 4	= 12.0
C	2.0	× 3	= 6.0
D	1.0	× 3	= 3.0
F	0.0	× 2	= 0.0
F B	3.0	× 2	= 6.0
I	—	× —	= —
ASC	—	× —	= —
		Totals	<u>18</u> <u>43.0</u>

Quality-Point Average = $\frac{\text{Total Quality Points (43.0)}}{\text{Total Credit Hours (18)}} = 2.389$

Academic Progress Criteria. It is expected that the student will at all times endeavor to achieve a high record of achievement. The Committee on Education reserves the right to review all students' records and deny readmission to those who fall below a minimum quality level of achievement. This requirement has been established as follows:

In order to be allowed to remain in the College, a student must have achieved a quality-point average of 1.2 at the completion of 24 quarter hours; 1.4 at the end of 48 quarter hours; and 1.6 at the end of 72 quarter hours.

A quality-point average of 1.75 is required for graduation with the Associate in Engineering or Associate in Science degree (96 Q.H.) and 1.80 for graduation with the Bachelor of Engineering Technology degree. (180 Q.H.)

It should be further noted that a student who accumulates the equivalent of six uncleared failures may be considered ineligible to continue his program of study.

The Registrar's Office will not be able to recalculate or confirm the calculations of quality point averages for individual students. Each student's record will be brought up to date before his graduation. In the meantime, borderline cases will be checked by the Lincoln College Committee on Education.

PROBATION

Scholastic Probation. The Committee on Education has the authority to dismiss from the College or place on scholastic probation any student whose scholarship is deficient for the following reasons: low quality-point average, excessive outstanding failures regardless of quality-point average.

A student on Scholastic Probation should be particularly diligent in his current courses and make every effort to clear his academic deficiencies as soon as possible. Students whose academic record does not improve or whose failures are not properly cleared may not be allowed to register for further courses.

When a student on Scholastic Probation has cleared all or a substantial part of his outstanding failures he may petition the Committee on Education for removal from the probation list.

Disciplinary Probation. The Committee on Education has the authority to dismiss from the College or place on Disciplinary Probation any student whom it may deem unworthy because of conduct or character. The Committee may ask any student to withdraw from the College who is obviously out of sympathy with its aims and ideals.

GRADUATION REQUIREMENTS

To receive the degree of Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology, the student must fulfill the following requirements:

1. Complete all the courses of his particular curriculum, either by attendance at the Lincoln College or by receiving Advanced Standing Credit.
2. Complete associate-degree programs in eight years and bachelor's programs in 12 years from the date of entrance into Lincoln College. Extensions of time may be granted by the Committee on Education.
3. Be in attendance for at least a year preceding the date on which he expects to graduate; that is, he must complete at least one full year's work in Lincoln College.

4. Achieve a quality-point average of at least 1.75 in courses taken in the College to be awarded the Associate in Engineering or Associate in Science degrees and 1.80 for the Bachelor of Engineering Technology degree.
5. Pay the Graduation Fee of \$25.

Graduation With Honor. Upon graduation, honors will be conferred upon students achieving the following quality-point averages: 3.00 Honor, 3.50 High Honor, 3.75 Highest Honor. In order to be eligible for honor graduation, a student must have completed at least half of the credits required for graduation in Lincoln College.

Attendance At Commencement. All candidates for a first degree (bachelor or associate) are required to attend Commencement in the year of qualification. First degrees in absentia are awarded only to candidates excused for personal or immediate family illness, military service, or obligations beyond the control of the candidate.

A petition to receive a degree in absentia must be presented to the Dean of the College.



General Financial Information

Students are expected to meet their financial obligations to the University or to make satisfactory arrangements with the Bursar's Office in order to be permitted to attend class sessions, to advance in class standing, to re-enroll after withdrawal, or to be conferred a degree. A certificate of honorable dismissal will be issued only to students who have a satisfactory financial standing. Checks should be drawn payable to Northeastern University.

INITIAL REGISTRATION FEE

The University initial registration fee of \$10 is to be paid at the time of first billing. This fee is nonrefundable.

TUITION

Tuition for Lincoln College credit courses is charged at the rate of \$21 per quarter hour of credit. Non-credit courses are charged at rates comparable to those of credit courses meeting on an equivalent contact-hour schedule.

Tuition, payable each quarter, is dependent upon the number of courses in which the student is enrolled and the quarter-hour credits awarded for each course. The following schedule indicates the tuition per quarter for courses offered by Lincoln College:

Course Tuition Per Quarter

Course Credits	\$21.00 per Q.H.
2 Q.H.	\$42.00
3 Q.H.	\$63.00
4 Q.H.	\$84.00

Tuition for all courses is charged on a quarter basis and is payable in full at the beginning of each quarter. As a convenience without additional charge, and at the student's request, the Bursar's Office will allow payment in two installments.

DEFERRED-PAYMENT PRIVILEGE

Occasionally situations develop, usually beyond the control of the student, which make it difficult to meet payments in the regular manner. Under such circumstances the student is advised to discuss his problem personally with the Bursar's Office where a convenient deferred payment agreement can be worked out. A service fee of \$2 is charged for this privilege.

LATE-PAYMENT FEE

Payments of tuition are due by Saturday of the week in which the bill is dated. If payment is not made, or a deferred payment agreement arranged by that date, a late fee of \$5 is charged by the Bursar.

REFUND OF TUITION

The Registrar's Office, 120 Hayden Hall, must be notified on an official form of a student's withdrawal. All refund adjustments are computed as of the date on which the official withdrawal slip is filed in the Registrar's Office.

TUITION UNDERWRITTEN BY EMPLOYERS

An increasing number of companies are underwriting part or all of the cost of tuition of students in their employ. In cases in which payment is made directly by the employer to the University, the student should furnish the Bursar's Office a purchase order covering his registration or a statement from an officer of his company certifying that the company is underwriting the tuition.

STUDENT CENTER FEE

Students attending the Boston Campus will be assessed a Student Center Fee of 75¢ per quarter.

LABORATORY FEES

All students taking a chemistry laboratory course which includes laboratory must purchase from the Bursar's Office a Laboratory Fee and Deposit Card for \$15. Upon completion of the course or withdrawal during the quarter, the student must check out his locker with the stockroom attendant. The Bursar's Office will then refund any unused balance shown on the Laboratory Fee and Deposit Card.

MAKEUP MID-TERM EXAMINATION FEE

Students absent from a regularly scheduled mid-term examination during a course may petition for a makeup. The fee for each test requested by the student is \$3. The fee must be paid when the petition is filed in the Lincoln College Office.

SPECIAL FINAL EXAMINATION FEE

Students absent from the regularly scheduled final examination at the end of a course may petition for a "special final examination." The fee for each examination requested by the student is \$5. The fee must be paid when the petition is filed in the University Registrar's Office.

PROFICIENCY EXAMINATION FEE

Applicants for admission may petition to be awarded advanced standing on the basis of achievement demonstrated by a "proficiency examination." The fee for each examination requested by the applicant is \$10. The fee must be paid when the petition is filed in the Lincoln College Office.

GRADUATION FEE

The University graduation fee, charged to those who are candidates for the associate or bachelor's degree, is \$25, payable on or before May 1 of the year in which the student expects to graduate.

TRANSCRIPT OF RECORD FEE

Students may request transcripts of their records at the University Registrar's Office. There is no charge for the first transcript. After the initial transcript there is a charge of \$1 per copy, payable in advance if more than one transcript is requested at one time. The charge is \$1 for the first copy and 50¢ for each additional copy.

TEXTBOOKS AND SUPPLIES

Students purchase their own textbooks and work materials. The cost varies according to the subject for which the student is enrolled. The average cost for a normal program of four subjects generally ranges from \$20 to \$30. Textbooks for single courses range from \$4 to \$15.

Students enrolled in Engineering Graphics should be prepared to spend \$10 to \$15 for drawing supplies and \$10 to \$20 for a set of drawing instruments in addition to the textbooks.

LOAN PROGRAMS

National Defense Student Loan Program

Any student in good standing who can demonstrate financial need is eligible to apply to the Director of Financial Aid for Students at Northeastern for assistance under the National Defense Student Loan Program. Recipients of the loans are selected by the University. The law requires that each borrower be at least a half-time student, in need of the amount of the loan, and capable of maintaining a good standing in his chosen course of study.

A student may borrow up to \$1,000 in one year, and a maximum of \$5,000 during his entire college career. Special consideration is given to superior students.

Loans to students who plan to teach in elementary and secondary schools or in institutions of higher education after graduation will be canceled up to a maximum of 50 per cent at the rate of 10 per cent for each year of such teaching. No interest is charged on loans until one year after graduation. Thereafter, interest is paid at the rate of 3 per cent per year. Borrowers may have up to 10 years to repay.

Higher Education Loan Plan (HELP)

The Massachusetts Higher Education Assistance Corporation was chartered in 1956 by the Massachusetts legislature to aid young men and women of the state to complete their programs of higher education. Students who are residents of Massachusetts and who have satisfactorily completed the freshman year are eligible for HELP loans. Loans are generally limited to \$1,000 in any one academic year, with an over-all limitation of \$3,000.

Full information and the required application forms may be obtained from any of the national banks and trust companies in Massachusetts participating in the program.

This plan is also used by most other states and Canada to provide assistance for undergraduate or graduate students. In New York, New Jersey, and Rhode Island, freshmen are eligible to borrow under this program. Students should check with their state Higher Education Assistance Corporation for further details.

University Long-Term Loan Fund

Northeastern maintains a loan fund for the purpose of aiding students in meeting their tuition expenses from quarter to quarter.

This fund is in many ways similar to the National Defense Loan Fund. Money borrowed need not be repaid until after graduation; and interest, at the rate of 3 per cent, does not become effective until one year after that time.

Students who qualify for this assistance may borrow as much as full tuition for any given quarter.

The New England Society Student Loaning Fund

The purpose of this revolving Student Loaning Fund, established by the New England Society, is to make available to deserving students, especially those of New England birth or ancestry, small amounts of money as temporary loans to meet emergencies.

It is not intended to be used for large loans to cover scholarship, board, or room rent, or for loans which will be outstanding more than three months.



Student and Alumni Information

STUDENT ACTIVITIES

Student activities for part-time students are planned, organized and operated by the student body with the assistance of the Assistant Director of Student Activities. The programs are flexible and are designed to keep pace with the changing needs of adult students and to provide maximum opportunity for student participation. All part-time students in Lincoln College are welcome to participate.

The Student Activities office is particularly interested in developing new clubs which will benefit students professionally and educationally. If students wish to start clubs related to their professions, this office will help them plan and organize such groups on a national level. The program is dedicated to assisting the adult student in the development of his fullest potential. The Student Activities Office is located in Room 254, Ell Student Center.

The purposes of evening student activities are:

To encourage and reward scholarship.

To provide opportunities for the development and pursuit of cultural interests and professional objectives.

To encourage the development of leadership activities and skills.

To enable the student to identify more closely with the University.

To include the family as an important and vital motivating force in the evening student's educational career.

Adult Student Council

The Adult Student Council was formed to provide a representative body to promote the welfare of the student body in non-academic areas and to foster extracurricular activities which will enrich University life. It affords participants opportunities to meet and develop close personal relationships with fellow students and administrative staff.

The Adult Student Council provides students with opportunities to develop leadership skills and gives them a chance to discuss matters of professional interest with experts in their chosen field.

The Council is made up of students appointed by the administration, representatives of part-time interest groups, and those specially certified by the Council because of their demonstrated interest in the overall adult programs of the University.

The A.S.C., a member of the International Association of Evening Student Councils, meets on the first Monday of each month at 8:30 p.m. Students are welcome to visit, observe, and express opinions concerning evening student life.

Society for the Advancement of Management

The Society for the Advancement of Management is the recognized national professional organization of managers in industry, commerce, government, and education. It has been dedicated to the advancement of management and managers since 1912, when the original Taylor Society was established. University chapters operate in 190 leading colleges and universities in the United States, Canada, Puerto Rico, and Hawaii.

The Northeastern University chapter is open to all adult students interested in furthering their growth and insight into the practice of the management professional. Meetings, conferences, and seminars are held.

Pi Tau Kappa Fraternity

Pi Tau Kappa is a social fraternity open to all evening students. It is organized to enhance their social welfare and promote closer affiliation with the University.

Kappa Tau Phi Sorority

Kappa Tau Phi Sorority is a social organization open to all evening women students. Its purpose is to promote fellowship among the women students and to form a closer tie with the University. Monthly dinner meetings are held. Two scholarships are awarded annually to scholastically superior women students.

LAMPLIGHTER

Lamplighter is a monthly news publication serving evening students. Any student who is interested in working on this publication should communicate with Room 254, Ell Student Center.

ALUMNI ASSOCIATION

More than 37,000 alumni are members of the all-University Alumni Association, which has as its prime purposes the promotion of the welfare of Northeastern University, the establishment of a mutually beneficial relationship between the University and its alumni, and the perpetuation of fellowship among members of the Association.

The Association headquarters and Alumni Lounge are located in Rooms 225 and 226 Richards Hall, respectively. The official records and addresses of alumni are maintained in Room 20 of the Forsyth Annex.

The official publication of the Alumni Association, **The Northeastern University ALUMNUS**, is published quarterly and sent free of charge to all alumni on record.

Activities of the Association, including the Homecoming Day celebration and the annual presentation of Professional Promise Awards to outstanding seniors in each of the Colleges, are directed by the Vice President for Alumni Affairs. Alumni officers also attend meetings of undergraduate classes to form a closer relationship between the Association and its future members.

The Alumni Relations Office assists the various class officers in planning class reunions. Each class normally holds a reunion every five years during the month of June. The Vice President for the Alumni Class Council is responsible for coordinating class activities and organizing class functions.

The Vice President for Alumni Clubs works in close association with officers of the more than 40 Regional Alumni Clubs which have been established from coast to coast. All alumni are eligible to become members of these organizations. The alumni clubs meet periodically, often in conjunction with visits from members of the faculty or with athletic events.

For Boston area alumni, monthly luncheon meetings are held in both the downtown and uptown sections of the city.

The Association also sponsors and assists the alumnae organization, and the Varsity Club, both of which have their own officers and conduct various programs throughout the year. Through the Varsity Club, the Association presents trophies to the outstanding athlete of the year in each of the six major sports.

The Northeastern University Alumni Association is a member of the American Alumni Council, a professional organization composed of representatives of all major colleges and universities in the United States and Canada.

ALUMNI RELATIONS

The Alumni Association is providing a uniquely valuable service to both the University and the community by sponsoring admissions conferences for parents of high school students who are interested in attending college.

These meetings, held in cooperation with the Northeastern Department of Admissions, have been extremely well attended. Local residents as well as alumni of the University have been invited to these conferences, which help to clarify many of the questions today's parents and young people have concerning application procedures of colleges and universities.

PLACEMENT SERVICE

Many requests from employers are received by the College, for men and women of potential ability to fill important positions of responsibility. It is the policy of the College to serve the students whenever possible by placing them in those positions which promise attractive opportunities for development and advancement. The College, however, cannot guarantee to place its students, but it does endeavor to keep in close touch with those who desire placement service and to assist them in obtaining satisfactory advancements in positions and income. No charge is made for placement service. Those needing this assistance should arrange an appointment with the Director of Placement.

While the College cannot guarantee positions to its graduates, the number of requests usually exceeds the number available in the graduating class of any given year. The policy of the College is to find the best equipped and qualified men and women among its graduates for the positions which the College is called upon to fill.

The College, in recommending a graduate for a position, furnishes the prospective employer with the facts as to the graduate's ability, character, attitudes, habits, and other qualifications for the position as revealed by the College records. In the last analysis, however, placement in a position depends largely upon the graduate's ability to sell his services to the prospective employer. Most employers prefer to consider two or more candidates for a position and generally request the College to suggest more than one person. Many manufacturing and commercial firms throughout New England call upon the College to assist them in filling important executive and managerial positions.

Programs of Instruction

DEGREES AND CERTIFICATES

Lincoln College conducts educational programs on the undergraduate level in various technological areas leading to the following degrees and certificates:

1. Associate in Science degree (A.S.) requiring 96 to 99 quarter hours of credit.
2. Associate in Engineering degree (A.E.) requiring 96 quarter hours of credit.
3. Bachelor of Engineering Technology degree (B.E.T.) requiring 180 quarter hours of credit.
4. Certificates may be earned with a minimum of 24 quarter hours of credit.
5. Special program or single courses are available for special students.

Lincoln College collaborates with University College in programs leading to:

A Bachelor of Science degree (B.S.) requiring 174 to 180 quarter hours of credit.

ASSOCIATE DEGREE GRADUATES

Graduates of the Engineering or Science Technology programs in Lincoln College, or other similar colleges and institutions, who have earned the Associate in Engineering or the Associate in Science degrees, may transfer applicable credits toward the degree requirements in the baccalaureate programs in Engineering Technology, Medical Technology or Industrial Technology.

Those who have maintained a quality-point average of 2.500 or higher in the associate degree programs may transfer to either of the following College of Engineering curricula: (1) day-college Cooperative Education programs in Civil, Mechanical, Electrical, Industrial or Chemical Engineering with credit for the first year of the five-year program, or (2) the part-time evening programs in Civil or Electrical Engineering with credit for the first two years of the eight-year programs.

TRANSFER STUDENTS

Students transferring from community colleges, junior colleges, technical institutes, or other colleges and universities may transfer applicable credits toward the degree requirements of Lincoln College.

FOUNDATIONS FOR TECHNOLOGY**(Non-Credit)**

Beginning students, who have been away from formal study for some time, frequently are concerned about their study habits and their mathematics and science backgrounds. Applicants who anticipate some problems in adjusting to college study are advised to give serious consideration to enrolling in the non-credit introductory course, the reading improvement program or doing review work through programmed instruction.

Introductory Courses

These courses are designed to develop background for basic courses in the degree programs and thus increase the probability of successful achievement in advanced technology courses.

Introductory Mathematics I and II. A two-quarter review of high school Algebra I and some plane geometry. These courses are required of students who do not demonstrate sufficient algebra proficiency on the Mathematics Placement Test. (See course description for 10.301 and 10.302, page 112.)

Introductory Physics I and II. A two-quarter relatively non-mathematical introduction to the concepts of physics designed to prepare students for the credit sequence in Physics. (See course description for 11.301 and 11.302, page 114.)

Introductory Chemistry I and II. A two-quarter relatively non-mathematical introduction to the concepts of chemistry designed to prepare students for the credit sequence in General Chemistry. (See course description for 12.301 and 12.302, page 116.)

Reading Improvement

The ability to read well is one of the most important basic tools for the successful completion of a college program. The University's Center for Reading Improvement gives the student an opportunity to develop good reading habits in preparation for the intensive reading assignments of college level courses. The following core skills are covered: previewing, locating main ideas and related details, using guide words and phrases, identifying structural patterns, outlining and summarizing, note-taking, vocabulary building, skimming and scanning, speed-reading and critical reading. Further information may be obtained at the Center for Reading Improvement.

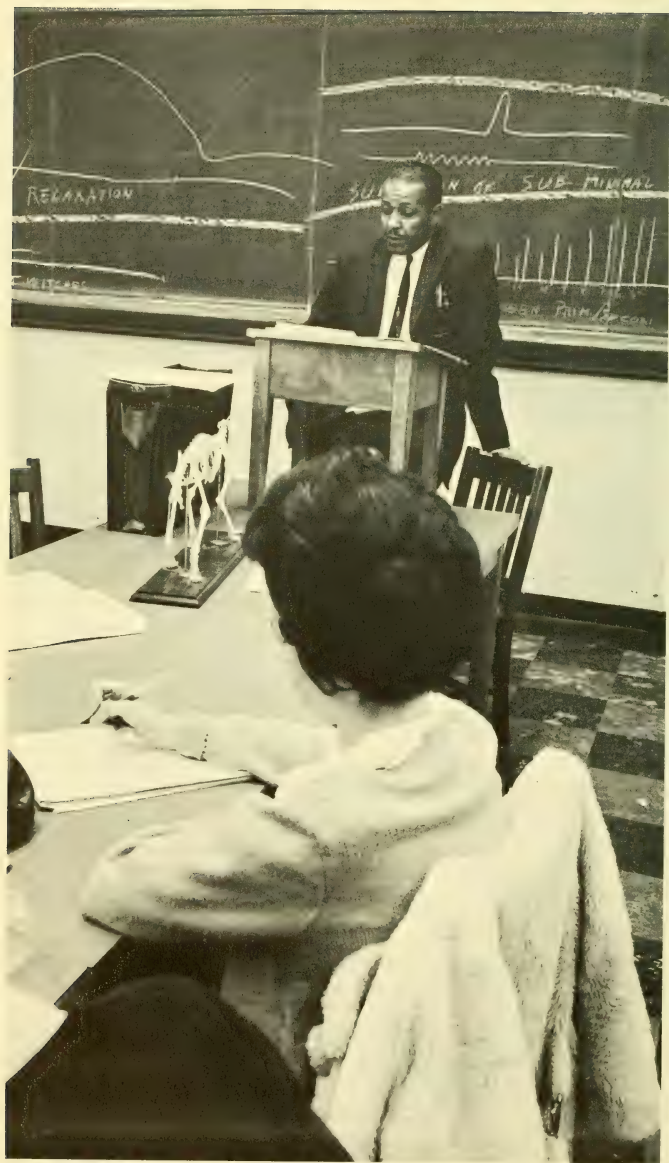
Programmed Study

Students may enroll in non-credit, self-study courses to better prepare themselves for college academic work and strengthen their high school background at the University's Center for Programmed Study.

Courses which may be useful to students in the Lincoln College programs in technology are:

Slide Rule	Trigonometry	Effective Listening	Spelling
Algebra	Study Skills	Calculus	English

The Center is open Monday through Thursday from 8 a.m. to 10 p.m.; Friday from 8 a.m. to 6 p.m.; Saturday from 8:30 a.m. to 12:30 p.m.; and Sunday from 1 p.m. to 5 p.m. Descriptions and full information may be obtained at the Center for Programmed Study.



SCIENCE TECHNOLOGY PROGRAMS

The Science Technology programs offered by Lincoln College present a variety of interdisciplinary combinations of the theoretical and basic sciences (biology, chemistry, mathematics, physics) rather than the applied and engineering sciences, emphasized in the Engineering Technology programs. In contrast to the Engineering Technology programs which concentrate heavily on application, design, efficiency and cost, the Science Technology curricula devote more courses to theoretical concepts, analytical methods and laboratory investigating techniques. Where employment opportunities for the engineering technologist lie in organizations and industries concerned with present-day engineering, design, and production methods, the science technologist will find his opportunities concerned with the frontiers of knowledge and the newly emerging sciences.

Organizations dealing with nuclear, environmental, meteorological, oceanographic, chemical and physical research as well as the pharmaceutical, hospital clinical laboratories or agencies concerned with health and medicine are likely places of employment.

General Science Teaching Option

Graduates of the baccalaureate program in Chemical-Biological Technology, who have maintained a quality-point average of 2.300 or higher and have included courses in Adolescent Psychology and Principles of Teaching among their electives may apply for admission to the Northeastern University Graduate School of Education in which requirements for teacher certification and the Master of Education degree may be completed.

The Science Technology related programs offered by Lincoln College are:

Associate in Science Degree

Chemical-Biological Technology	page 56
Chemical-Physical Technology	page 57
Mathematical-Physical Technology	page 59

Bachelor of Science Degree

Chemical-Biological Technology	pages 60-61
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CHEMICAL-BIOLOGICAL TECHNOLOGY**Leading to the Degree of Associate in Science**

The program in Chemical-Biological Technology provides the chemistry and biology foundation required by medical and industrial laboratory assistants and technicians in clinically, chemically or biologically oriented organizations, and for persons having various paramedically related responsibilities. Employment opportunities are in general hospitals, health clinics, research foundations, chemical and drug industries, public health organizations, water and sanitation departments; and in the emerging fields of the oceanographic technologies.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken well in advance of the registration date.

FIRST YEAR

Course Number	Course	Q.H.
10.501, 10.502, 10.503	Mathematics I, II, III	6
11.304, 11.305, 11.306	General Physics I, II, III	6
12.314, 12.315, 12.316	General Chemistry and Lab. I, II, III	9
30.504, 30.505, 30.506	English I, II, III	6

SECOND YEAR

10.320, 10.321, 10.322	Calculus I, II, III	}	8
	or		
10.316, 10.317, 10.318	Probability and Statistics I, II, III	}	6
12.321, 12.322, 12.323	Analytical Chemistry I, II, III		6
12.324, 12.325, 12.326	Analytical Chemistry Lab. I, II, III		6
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III		6

THIRD YEAR

12.331, 12.332, 12.333	Organic Chemistry I, II, III	6
12.334, 12.335, 12.336	Organic Chemistry Lab. I, II, III	6
18.311, 18.312, 18.313	General Biology and Lab. I, II, III	12

FOURTH YEAR

18.321, 18.322, 18.323	Microbiology and Lab. I, II, III	12
73.311, 73.312, 73.313	Clinical Biochemistry I, II, III	6
	Elective	6

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degrees.

CHEMICAL–PHYSICAL TECHNOLOGY**Leading to the Degree of Associate in Science**

The program in Chemical–Physical Technology prepares the graduate to assume responsibilities related to the analysis, synthesis and production of products involving chemical as well as physical changes. The curriculum provides both theoretical and laboratory training in the traditional branches of chemistry but also includes modern instrumental, radio chemistry and nuclear technology. It provides broad rather than specialized training so as to have applicability in many chemistry-related fields. Employment opportunities are in manufacturing and pharmaceutical plants producing drugs, oils, synthetics and plastics; as well as in private and industrial research laboratories concerned with the development of processes, by-products and new knowledge.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken well in advance of the registration date.

FIRST YEAR

Course Number	Course	Q.H.
10.311, 10.312	College Algebra I, II	4
10.313, 10.314	College Trigonometry I, II	4
10.320	Calculus I	4
11.304, 11.305, 11.306	General Physics I, II, III	6
12.314, 12.315, 12.316	General Chemistry and Lab. I, II, III	9

SECOND YEAR

10.321, 10.322, 10.323	Calculus II, III, IV	6
12.321, 12.322, 12.323	Analytical Chemistry I, II, III	6
12.324, 12.325, 12.326	Analytical Chemistry Lab. I, II, III	6
30.504, 30.505, 30.506	English I, II, III	6

THIRD YEAR

12.331, 12.332, 12.333	Organic Chemistry I, II, III	6
12.334, 12.335, 12.336	Organic Chemistry Lab. I, II, III	6
11.321, 11.322, 11.323	Particles and Waves I, II, III	6
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6

FOURTH YEAR

12.341, 12.342, 12.343	Physical Chemistry I, II, III	6
12.351, 12.352, 12.353	Instrumental and Radio Chemistry I, II, II	6
12.381, 12.382, 12.383	Nuclear Technology I, II, III	6
	Elective	6

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.



MATHEMATICAL–PHYSICAL TECHNOLOGY**Leading to the Degree of Associate in Science**

The program in Mathematical–Physical Technology is designed to establish a firm background in the concepts of physics and mathematics with sufficient chemistry to allow effective communication between technologist and professional. The intensity of courses introduces theoretical depth for concept development but places emphasis at the level of application and performance.

Graduates may serve as high-level technicians and laboratory assistants in such fields as environmental and space science. Working with the professional engineer or scientist, he may assist in performing intricate and detailed experiments; collect, organize and reduce technical data to manageable form for analysis; or perform investigations requiring mathematical and scientific backgrounds. Opportunities exist in the wide spectrum of research and development organizations which deal in the physical, mathematical and engineering sciences.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken well in advance of the registration date.

FIRST YEAR

Course Number	Course	Q.H.
10.311, 10.312	College Algebra I, II	4
10.313, 10.314	College Trigonometry I, II	4
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12

SECOND YEAR

03.301, 03.302, 03.303	Circuit Theory I, II, III	6
10.321, 10.322, 10.323	Calculus II, III, IV	6
11.321, 11.322, 11.323	Particles and Waves I, II, III	6
12.314, 12.315, 12.316	General Chemistry and Lab. I, II, III	9

THIRD YEAR

09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
10.324, 10.325, 10.326	Differential Equations I, II, III	6
12.321, 12.322, 12.323	Analytical Chemistry I, II, III	6
11.341, 11.342, 11.343	Physics Laboratory I, II, III	6

FOURTH YEAR

10.351, 10.352, 10.353	Advanced Mathematics I, II, III	6
11.331, 11.332, 11.333	Advanced Physics I, II, III	6
	Elective I, II, III	6
	Elective I, II, III	6

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

CHEMICAL-BIOLOGICAL TECHNOLOGY**Leading to the Degree of Bachelor of Science**

The Chemical-Biological Technology program is an interdisciplinary program integrating theoretical and laboratory course sequences from the fields of Chemistry and Biology which prepare the student to assume responsibilities in laboratory careers which emphasize laboratory applications and teaching careers in general science. Employment opportunities are in a wide variety of industrial, pharmaceutical, clinical and hospital laboratories dealing with analytical, production and research functions and in secondary school education in the teaching of general science, chemistry, biology and other related courses.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken well in advance of the registration date.

FIRST YEAR

Course Number	Course	Q.H.
10.501, 10.502, 10.503	Mathematics I, II, III	6
11.304, 11.305, 11.306	General Physics I, II, III	6
12.314, 12.315, 12.316	General Chemistry and Lab. I, II, III	9
30.504, 30.505, 30.506	English I, II, III	6

SECOND YEAR

10.320, 10.321, 10.322	Calculus I, II, III	}	8
	or		
10.316, 10.317, 10.318	Probability and Statistics I, II, III	}	6
18.311, 18.312, 18.313	General Biology and Lab. I, II, III		12
23.501, 23.502, 23.503	Western Civilization, I, II, III		6

THIRD YEAR

12.331, 12.332, 12.333	Organic Chemistry I, II, III	6
12.334, 12.335, 12.336	Organic Chemistry Lab. I, II, III	6
18.324, 18.325, 18.326	Human Anatomy and Physiology I, II, III	6
19.501, 19.502, 19.503	Psychology I, II, III	6

FOURTH YEAR

12.324, 12.325, 12.326	Analytical Chemistry Lab. I, II, III	6
12.324, 12.325, 12.326	Analytical Chemistry I, II, III	6
18.321, 18.322, 18.323	Microbiology and Lab. I, II, III	12

FIFTH YEAR

18.351, 18.352, 18.353	Histology-Organology I, II, III	6
39.501, 39.502, 39.503	Economic Principles and Problems I, II, III	6
12.351, 12.352, 12.353	Instrumental and Radiochemistry I, II, III	6
16.531, 16.532, 16.533	Oceanography I, II, and Marine Geology	6

SIXTH YEAR

18.314, 18.315, 18.316	Botany I, II, III	9
73.311, 73.312, 73.313	Clinical Biochemistry I, II, III	6
21.501, 21.502, 21.503	Sociology I, II, III	6
	*Elective	6

SEVENTH YEAR

18.357, 18.358, 18.359	Genetics I, II, III	6
30.507, 30.508, 30.509	Introduction to Literature I, II, III	6
	*Elective	6
	*Elective	6

*General Science Teacher Option—Students planning to apply to the Northeastern University Graduate School of Education must include courses in Adolescent Psychology and Principles of Teaching among the electives.



ALLIED—MEDICAL TECHNOLOGY PROGRAMS

The Allied—Medical Technologies encompass the newly emerging category of occupations concerned with the applications of the biological, engineering, natural, and physical sciences in the technological service fields which support the health, medical, and pharmaceutical professions.

The need for competent technological specialists has been created by greater knowledge resulting from biological, chemical, medical, and pharmaceutical research; technological developments in the fields of laboratory analysis, nuclear and radiological technology; and the increased use of sophisticated equipment and electronic instrumentation. The demand for these new technologists exists in hospitals, clinics and public health organizations; biological and pharmaceutical research foundations; the chemical and drug industries; and organizations which design, develop and manufacture equipment for these fields.

In response to this need, Lincoln College has expanded its offerings to include the biology, chemistry and other special clinical technology courses which provide the technological core for the Allied—Medical Technologies.

The Allied—Medical Technology related programs offered by Lincoln College are:

Associate in Engineering Degree

Bioelectronic Engineering Technology page 63

Bachelor of Science Degree

Cytotechnology pages 64–65
Medical Technology pages 66–67

BIOELECTRONIC ENGINEERING TECHNOLOGY**Leading to the Degree of Associate in Engineering**

The program in Bioelectronics Engineering Technology prepares the graduate to assume responsibilities related to the design, installation, and operation of modern medical electronic devices used in the measurement, recording and analysis of anatomical, physiological, and biochemical functions in humans and animals. The curriculum builds heavily on electronics theory, chemistry and human physiology with emphasis on typical bioelectronic devices and their laboratory applications. Employment opportunities are in biological, chemical, physiological and pharmaceutical research laboratories; in clinics and hospital in relation to medical diagnoses and patient care; as well as in industrial organizations concerned with the design, development and production of the equipment.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken well in advance of the registration date.

FIRST YEAR

Course Number	Course	Q.H.
10.311, 10.312	College Algebra I, II	4
10.313, 10.314	College Trigonometry I, II	4
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12

SECOND YEAR

03.301, 03.302, 03.303	Circuit Theory I, II, III	6
10.321, 10.322, 10.323	Calculus II, III, IV	6
09.307, 09.308, 09.309	Electrical and Electronic Graphics I, II, III	6
12.311, 12.312, 12.313	*General Chemistry I, II, III	6

THIRD YEAR

03.304, 03.306, 03.323	Circuit Theory IV, Electrical Measurements and Electronic Lab.	6
03.311, 03.312, 03.313	Electronics I, II, III	12
12.341, 12.342, 12.343	Physical Chemistry I, II, III	6

FOURTH YEAR

03.351, 03.352, 03.353	Bioelectronic Devices I, II, III	6
03.357, 03.358, 03.359	Bioelectronic Lab. I, II, III	6
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
18.324, 18.325, 18.326	Anatomy and Physiology I, II, III	6

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, Bachelor of Engineering Technology, or Bachelor of Science degree.

*Student may elect 12.314, 12.315, 12.316 General Chemistry and Laboratory.

CYTOTECHNOLOGY

Leading to the Degree of Bachelor of Science

A program offered through the cooperating efforts of Lincoln College and University College and conducted in affiliation with the several hospitals which comprise the Boston School of Cytotechnology. The program leads to the Bachelor of Science Degree, which is awarded by University College, and certification of registration by the American Society of Clinical Pathologists.

Cytotechnology is a specialty in the broader field of medical technology. Cytotechnologists are employed in pathology laboratories, where they expertly examine slides of cells looking for minute abnormalities which are the early warning signs of cancer and related disease. Cytotechnology occupies a highly important place in clinical medicine requiring a technician with not only highly specialized laboratory training but also sound academic background.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken well in advance of the registration date.

FIRST YEAR

Course Number	Course	Q.H.
10.501, 10.502, 10.503	Mathematics I, II, III	6
11.304, 11.305, 11.306	General Physics I, II, III	6
12.314, 12.315, 12.316	General Chemistry and Lab. I, II, III	9
30.504, 30.505, 30.506	English I, II, III	6

SECOND YEAR

10.320, 10.321, 10.322	Calculus I, II, III	}	8
	or		
10.316, 10.317, 10.318	Probability and Statistics I, II, III	}	6
18.311, 18.312, 18.313	General Biology and Lab. I, II, III		12
23.502, 23.502, 23.503	Western Civilization I, II, III		6

THIRD YEAR

12.331, 12.332, 12.333	Organic Chemistry I, II, III	6
12.334, 12.335, 12.336	Organic Chemistry Lab. I, II, III	6
18.324, 18.325, 18.326	Human Anatomy and Physiology I, II, III	6
19.501, 19.502, 19.503	Psychology I, II, III	6

FOURTH YEAR

12.321, 12.322, 12.323	Analytical Chemistry I, II, III	6
12.324, 12.325, 12.326	Analytical Chemistry Lab. I, II, III	6
18.321, 18.322, 18.323	Microbiology and Lab. I, II, III	12

FIFTH YEAR

18.351, 18.352, 18.353	Histology-Organology I, II, III	6
86.504, 18.505, 18.506	Foundations of Medical Science I, II, III	}
	or	
86.502, 18.502	*Medical Terminology, Hospital Law and Ethics	6
18.391	*Photomicroscopy	6
6 months	AMA-Approved Hospital School of Cytotechnology	}
6 months	Internship	
		15†

SIXTH YEAR

39.501, 39.502, 39.503	Economic Principles and Problems I, II, III	6
73.311, 73.312, 73.313	Clinical Biochemistry I, II, III	6
	Elective	6
	Elective	6

SEVENTH YEAR

18.341, 18.342, 18.343	Hematology I, II, III	6
30.507, 30.508, 30.509	Introduction to Literature I, II, III	6
	Elective	6
	Elective	6

*May be replaced by 86.504, 86.505, 86.506 Foundations of Medical Science I, II, III.

†Student will take Registry Examination at the end of hospital training period before academic credit for hospital school phase is officially granted.



MEDICAL TECHNOLOGY

Leading to the Degree of Bachelor of Science

The program in Medical Technology is a joint Lincoln College—University College program which is conducted in affiliation with several Hospital Schools of Medical Technology approved by the American Medical Association. The program leads to the Bachelor of Science Degree, which is awarded by University College, and entitles the student to take the registration examination of the American Society of Clinical Pathologists.

The medical technologist is a most respected and important member of the paramedical team. He works as a professional in close association with pathologists, doctors and hospital and medical laboratory personnel. Performing in a variety of specialized fields such as bacteriology, histology, biochemistry, and nuclear and radiochemistry, the medical technologist performs chemical tests, and morphologically and biochemically identifies bacteria. He makes important observations necessary for critical diagnosis by the doctor for early detection and treatment of diseases.

The Registered Medical Technologist is in constant demand in hospital laboratories, clinics, public health agencies, pharmaceutical firms, research foundations and in the Armed Forces.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken well in advance of the registration date.

FIRST YEAR

Course Number	Course	Q.H.
10.501, 10.502, 10.503	Mathematics I, II, III	6
11.304, 11.305, 11.306	General Physics I, II, III	6
12.314, 12.315, 12.316	General Chemistry and Lab. I, II, III	9
30.504, 30.505, 30.506	English I, II, III	6

SECOND YEAR

10.320, 10.321, 10.322	Calculus I, II, III	}	8
	or		
10.316, 10.317, 10.318	Probability and Statistics I, II, III	}	6
18.311, 18.312, 18.313	General Biology and Lab. I, II, III		12
23.501, 23.502, 23.503	Western Civilization I, II, III		6

THIRD YEAR

12.331, 12.332, 12.333	Organic Chemistry I, II, III	6
12.334, 12.335, 12.336	Organic Chemistry Lab. I, II, III	6
18.324, 18.325, 18.326	Human Anatomy and Physiology I, II, III	6
19.501, 19.502, 19.503	Psychology I, II, III	6

FOURTH YEAR

12.321, 12.322, 12.323	Analytical Chemistry I, II, III	6
12.324, 12.325, 12.326	Analytical Chemistry Lab. I, II, III	6
18.321, 18.322, 18.323	Microbiology and Lab. I, II, III	12

FIFTH YEAR

73.311, 73.312, 73.313	Clinical Biochemistry I, II, III	6
39.501, 39.502, 39.503	Economic Principles and Problems I, II, III	6
12.351, 12.352, 12.353	Instrumental and Radiochemistry I, II, III	6
	*Elective	6

SIXTH YEAR

12 months	Internship at an A.M.A.—Approved Hospital School of Medical Technology	30
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SEVENTH YEAR

18.341, 18.342, 18.343	Hematology I, II, III	6
30.507, 30.508, 30.509	Introduction to Literature I, II, III	6
	*Elective	6
	*Elective	6

* Before registering for any electives, student should submit a proposed program of elective courses — preferably representing a minor field of concentration consistent with his personal career objectives — for approval by the Committee on Education.

10.324, 10.325, 10.326 Differential Equations I, II, III is recommended for all students planning advanced engineering technology subjects.

CIVIL ENGINEERING TECHNOLOGY PROGRAMS

Civil Engineering deals with the planning and construction of all kinds of relatively permanent structures and public works. Its major functions are: the preparation of surveys (topographical, geological, traffic, utility, etc.); the design of structures (buildings, bridges, dams, harbor facilities, etc.); the planning of municipal systems (water, sanitary, gas, flood control, etc.); and the development of transportation facilities (highway, railway, waterway, airway, etc.).

In performing these functions, the civil engineer will work in close association with professionals in the field, and he may develop technologically to function independently and in positions of managerial responsibility.

Employment opportunities for Civil Engineering Technology program graduates are with town, city, state or federal public works departments and agencies; private consulting, engineering, architectural and construction organizations; and with railroads and the military.

The Civil Engineering Technology related programs offered to the Lincoln College students are:

Associate in Engineering Degree

Municipal and Sanitary Engineering Technology	page 69
Structural Engineering Technology	page 70
Surveying and Transportation Engineering Technology	page 71

Bachelor of Engineering Technology Degree

Civil Engineering Technology	pages 72-73
Mechanical-Structural Engineering Technology	pages 74-75

MUNICIPAL AND SANITARY ENGINEERING TECHNOLOGY**Leading to the Degree of Associate in Engineering**

The program in Municipal and Sanitary Engineering Technology prepares the graduate to assume responsibilities related to the design, construction, operation and supervision of municipal plants and systems concerned with the storage and distribution of water and also the disposal of sewage and waste in urban areas with due consideration for contamination and pollution. Employment opportunities are with town, city, and state public works departments, private engineering consultants, architects, contractors and many other engineering organizations.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken well in advance of the registration date.

FIRST YEAR

Course Number	Course	Q.H.
10.311, 10.312	College Algebra I, II	4
10.313, 10.314	College Trigonometry I, II	4
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12

SECOND YEAR

01.301, 01.302, 01.303	Surveying I, II, III	6
02.301, 02.302, 02.303	Mechanics (Statics) I, II, III	6
10.321, 10.322, 10.323	Calculus II, III, IV	6
09.311, 09.312, 09.313	Mechanical and Structural Graphics I, II, III	6

THIRD YEAR

01.341, 01.342, 01.343	Fluid Mechanics I, II, III	6
02.321, 02.322, 02.323	Stress Analysis I, II, III	6
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
12.311, 12.312, 12.313	*General Chemistry I, II, III	6

FOURTH YEAR

01.324, 01.325, 01.326	Structural Analysis I, II, III	6
01.351, 01.352, 01.353	Municipal and Sanitary Engineering I, II, III	6
01.361, 01.362, 01.363	Materials and Soil Mechanics I, II, III	6
01.371, 01.372, 01.373	Reinforced Concrete Design I, II, III	6

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, Bachelor of Engineering Technology, or Bachelor of Science degree.

*Students may elect to take 12.314, 12.315, 12.316 General Chemistry and Laboratory I, II, III.

STRUCTURAL ENGINEERING TECHNOLOGY**Leading to the Degree of Associate in Engineering**

The program in Structural Engineering Technology prepares the graduate to assume responsibilities related to the planning, design and supervision of the construction of buildings, bridges, foundations; flood-control projects and all fixed structures. Employment opportunities are with consulting engineering firms, architectural groups, contractors, railroads, government agencies, the military, and other design-related companies.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken well in advance of the registration date.

FIRST YEAR

Course Number	Course	Q.H.
10.311, 10.312	College Algebra I, II	4
10.313, 10.314	College Trigonometry I, II	4
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12

SECOND YEAR

01.301, 01.302, 01.303	Surveying I, II, III	6
02.301, 02.302, 02.303	Mechanics (Statics) I, II, III	6
10.321, 10.322, 10.323	Calculus II, III, IV	6
09.311, 09.312, 09.313	Mechanical and Structural Graphics I, II, III	6

THIRD YEAR

01.321, 01.322, 01.323	Introduction to Structures I, II, III	6
01.341, 01.342, 01.343	Fluid Mechanics I, II, III	6
02.321, 02.322, 02.323	Stress Analysis I, II, III	6
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6

FOURTH YEAR

01.324, 01.325, 01.326	Structural Analysis I, II, III	6
01.331, 01.332, 01.333	Design of Structures I, II, III	6
01.361, 01.362, 01.363	Materials and Soil Mechanics I, II, III	6
01.371, 01.372, 01.373	Reinforced Concrete Design I, II, III	6

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, Bachelor of Engineering Technology, or Bachelor of Science degree.

SURVEYING AND TRANSPORTATION ENGINEERING TECHNOLOGY**Leading to the Degree of Associate in Engineering**

The program in Surveying and Transportation Engineering Technology prepares the graduate to assume responsibilities related to the preparation and calculation of preliminary and legal surveys required for both small projects such as subdivision work, individual lot layouts, and highway layouts as well as more complex projects relating to sewer systems, pipelines, power transmission lines, dams, reservoirs and aqueducts. Employment opportunities are with independent surveying companies; civil engineering companies; highway, transit and railroad planning groups as well as cartographers, construction companies and contractors.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken well in advance of the registration date.

FIRST YEAR

Course Number	Course	Q.H.
10.311, 10.312	College Algebra I, II	4
10.313, 10.314	College Trigonometry I, II	4
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12

SECOND YEAR

01.301, 01.302, 01.303	Surveying I, II, III	6
02.301, 02.302, 02.303	Mechanics (Statics) I, II, III	6
10.321, 10.322, 10.323	Calculus II, III, IV	6
09.311, 09.312, 09.313	Mechanical and Structural Graphics I, II, III	6

THIRD YEAR

01.304, 01.305, 01.306	Advanced Surveying I, II, III	6
01.341, 01.342, 01.343	Fluid Mechanics I, II, III	6
02.321, 02.322, 02.323	Stress Analysis I, II, III	6
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6

FOURTH YEAR

01.307, 01.308, 01.309	Legal Aspects of Surveying I, II, III	6
01.311, 01.312, 01.313	Transportation Engineering I, II, III	6
01.361, 01.362, 01.363	Materials and Soil Mechanics I, II, III	6
01.371, 01.372, 01.373	Reinforced Concrete Design I, II, III	6

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, Bachelor of Engineering Technology, or Bachelor of Science degree.

CIVIL ENGINEERING TECHNOLOGY

Leading to the Degree of Bachelor of Engineering Technology

The program in Civil Engineering Technology prepares the graduate to assume broad responsibilities related to surveys required to develop initial design criteria and specifications, and to become involved in the planning, design and construction of all kinds of relatively permanent structures; municipal plants and systems or transportation systems and facilities. Employment opportunities are in private consulting firms, construction companies, and public works agencies. Work involving surveying, design and supervision is open to graduates.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken well in advance of the registration date.

FIRST YEAR

Course Number	Course	Q.H.
10.311, 10.312	College Algebra I, II	4
10.313, 10.314	College Trigonometry I, II	4
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12

SECOND YEAR

01.301, 01.302, 01.303	Surveying I, II, III	6
10.321, 10.322, 10.323	Calculus II, III, IV	6
30.504, 30.505, 30.506	English I, II, III	6
09.311, 09.312, 09.313	Mechanical and Structural Graphics I, II, III	6

THIRD YEAR

01.304, 01.305, 01.306	Advanced Surveying I, II, III	6
02.301, 02.302, 02.303	Mechanics (Statics) I, II, III	6
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
	*Elective I, II, III	6

FOURTH YEAR

01.307, 01.308, 01.309	Legal Aspects of Survey I, II, III	6
01.321, 01.322, 01.323	Introduction to Structures I, II, III	6
02.321, 02.322, 02.323	Stress Analysis I, II, III	6
23.501, 23.502, 23.503	Western Civilization I, II, III	6

FIFTH YEAR

12.311, 12.312, 12.313	†General Chemistry I, II, III	6
01.324, 01.325, 01.326	Structural Analysis I, II, III	6
01.341, 01.342, 01.343	Fluid Mechanics I, II, III	6
39.501, 39.502, 39.503	Economic Principles and Problems I, II, III	6

SIXTH YEAR

01.331, 01.332, 01.333	Design of Structures I, II, III	6
01.361, 01.362, 01.363	Materials and Soil Mechanics I, II, III	6
19.501, 19.502, 19.503	Psychology I, II, III	6
	*Elective I, II, III	6

SEVENTH YEAR

01.371, 01.372, 01.373	Reinforced Concrete Design I, II, III	6
01.311, 01.312, 01.313	Transportation Engineering I, II, III	6
	*Elective I, II, III	6

EIGHTH YEAR

01.351, 01.352, 01.353	Municipal and Sanitary Engineering I, II, III	6
30.507, 30.508, 30.509	Introduction to Literature I, II, III	6
	*Elective I, II, III	6

*Before registering for any electives, student should submit a proposed program of elective courses — preferably representing a minor field of concentration consistent with his personal career objectives — for approval by the Committee on Education.

10.324, 10.325, 10.326 Differential Equations I, II, III is recommended for all students planning advanced engineering technology subjects.

†Students may elect to take 12.314, 12.315, 12.316 Gen. Chem. and Laboratory I, II, III.

MECHANICAL-STRUCTURAL ENGINEERING TECHNOLOGY**Leading to the Degree of Bachelor of Engineering Technology**

The program in Mechanical-Structural Engineering Technology is interdisciplinary in that it prepares the graduate to assume responsibilities related to both the planning and construction of relatively static structures such as buildings, bridges, docks, etc. and also the design and production of dynamic machine tools, machinery, and other mechanical devices. The mechanical and structural content are integrated so as to be complementary and to provide a broad base for design problems of great variety. Employment opportunities lie in the architectural, construction, civil and mechanical professions and companies.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken well in advance of the registration date.

FIRST YEAR

Course Number	Course	Q.H.
10.311, 10.312	College Algebra I, II	4
10.313, 10.314	College Trigonometry I, II	4
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12

SECOND YEAR

09.314, 09.315, 09.316	Production Drawing and Design I, II, III	6
10.321, 10.322, 10.323	Calculus II, III, IV	6
30.504, 30.505, 30.506	English I, II, III	6
09.311, 09.312, 09.313	Mechanical and Structural Graphics I, II, III	6

THIRD YEAR

01.301, 01.302, 01.303	Surveying I, II, III	6
02.301, 02.302, 02.303	Mechanics (Statics) I, II, III	6
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
	*Elective I, II, III	6

FOURTH YEAR

01.321, 01.322, 01.323	Introduction to Structures I, II, III	6
02.304, 02.305, 02.306	Mechanics (Dynamics) I, II, III	6
02.321, 02.322, 02.323	Stress Analysis I, II, III	6
23.501, 23.502, 23.503	Western Civilization I, II, III	6

FIFTH YEAR

01.324, 01.325, 01.326	Structural Analysis I, II, III	6
01.341, 01.342, 01.343	Fluid Mechanics I, II, III	6
01.361, 01.362, 01.363	Materials and Soil Mechanics I, II, III	6
39.501, 39.502, 39.503	Economic Principles and Problems I, II, III	6

SIXTH YEAR

01.331, 01.332, 01.333	Design of Structures I, II, III	6
02.324, 02.325, 02.326	Advanced Stress Analysis I, II, III	6
19.501, 19.502, 19.503	Psychology I, II, III	6
	*Elective I, II, III	6

SEVENTH YEAR

01.371, 01.372, 01.373	Reinforced Concrete Design I, II, III	6
02.327, 02.328, 02.329	Mechanical Design I, II, III	6
	*Elective I, II, III	6

EIGHTH YEAR

02.331, 02.332, 02.333	Mechanical Technology Lab. I, II, III	6
30.507, 30.508, 30.509	Introduction to Literature I, II, III	6
	*Elective I, II, III	6

*Before registering for any electives, student should submit a proposed program of elective courses — preferably representing a minor field of concentration consistent with his personal career objectives — for approval by the Committee on Education.

10.324, 10.325, 10.326 Differential Equations I, II, III is recommended for all students planning advanced engineering technology subjects.



MECHANICAL ENGINEERING TECHNOLOGY PROGRAMS

Mechanical Engineering deals with the harnessing of power resources by means of machinery to perform useful work. In contrast to civil engineering which deals primarily with static forces and structures, mechanical engineering is more concerned with the motion and kinetics of devices which are activated by hydraulic, electrical, mechanical, or thermodynamic forces. Major functions of the mechanical engineer are: 1) design and installation of all kinds of machinery from pocket watches to the largest of steel boring mills; 2) development and production of engines and transportation equipment (automobile, aircraft, ship, railway, etc.); 3) construction and operation of furnaces, boilers as well as heating and air-conditioning equipment for the control of atmospheric and environmental conditions.

Employment opportunities for Mechanical Engineering Technology graduates are in the areas of 1) research, design or development; 2) production, operation, testing or control and 3) installation, maintenance and sales. In performing these functions, graduates will work in close association with professionals in the field and may develop technologically to function independently and in positions of managerial responsibility.

The Mechanical Engineering Technology program and related programs offered by Lincoln College are:

Associate in Engineering Degree

Mechanical Engineering Technology	page 78
Heat Engineering Technology	page 79

Bachelor of Engineering Technology Degree

Mechanical Engineering Technology	pages 80-81
Mechanical-Structural Engineering Technology	pages 82-83

MECHANICAL ENGINEERING TECHNOLOGY**Leading to the Degree of Associate in Engineering**

The program in Mechanical Engineering Technology prepares the graduate to assume responsibilities related to the design, production and installation of mechanical tools, machinery, engines and transportation equipment in which there is an intermingling of mechanical and hydraulic forces. Because of the increased mechanization of all industry, varied employment opportunities are available in private engineering consultant groups, and in light and heavy industries, as well as almost all engineering design organizations.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken well in advance of the registration date.

FIRST YEAR

Course Number	Course	Q.H.
10.311, 10.312	College Algebra I, II	4
10.313, 10.314	College Trigonometry I, II	4
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12

SECOND YEAR

02.301, 02.302, 02.303	Mechanics (Statics) I, II, III	6
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
10.321, 10.322, 10.323	Calculus II, III, IV	6
09.311, 09.312, 09.313	Mechanical and Structural Graphics I, II, III	6

THIRD YEAR

02.304, 02.305, 02.306	Mechanics (Dynamics) I, II, III	6
02.321, 02.322, 02.323	Stress Analysis I, II, III	6
02.341, 02.342, 02.343	Materials I, II, III	6
09.314, 09.315, 09.316	Production Drawing and Design I, II, III	6

FOURTH YEAR

01.341, 01.342, 01.343	Fluid Mechanics I, II, III	6
02.324, 02.325, 02.326	Advanced Stress Analysis I, II, III	6
02.327, 02.328, 02.329	Mechanical Design I, II, III	6
02.331, 02.332, 02.333	Mechanical Technology Lab. I, II, III	6

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, Bachelor of Engineering Technology, or Bachelor of Science degree.

HEAT ENGINEERING TECHNOLOGY**Leading to the Degree of Associate in Engineering**

The program in Heat Engineering Technology prepares the graduate to assume responsibilities related to the design, operation, and construction of engines and equipment in which there are thermodynamic, hydraulic and mechanical forces. Typical examples are automobile, aircraft, and ship engines; boilers and furnaces; as well as heating, air conditioning and ventilating devices. Employment opportunities are with architectural firms, engineering consultants, light and heavy mechanical industries, as well as other engineering oriented organizations.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken well in advance of the registration date.

FIRST YEAR

Course Number	Course	Q.H.
10.311, 10.312	College Algebra I, II	4
10.313, 10.314	College Trigonometry I, II	4
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12

SECOND YEAR

02.301, 02.302, 02.303	Mechanics (Statics) I, II, III	6
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
10.321, 10.322, 10.323	Calculus II, III, IV	6
09.311, 09.312, 09.313	Mechanical and Structural Graphics I, II, III	6

THIRD YEAR

02.304, 02.305, 02.306	Mechanics (Dynamics) I, II, III	6
02.321, 02.322, 02.323	Stress Analysis I, II, III	6
02.351, 02.352, 02.353	Thermodynamics I, II, III	6
09.314, 09.315, 09.316	Production Drawing and Design I, II, III	6

FOURTH YEAR

01.341, 01.342, 01.343	Fluid Mechanics I, II, III	6
02.354, 02.355, 02.356	Heat Transfer I, II, III	6
02.357, 02.358, 02.359	Heat Engineering I, II, III	6
02.361, 02.362, 02.363	Heat Technology Lab. I, II, III	6

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, Bachelor of Engineering Technology, or Bachelor of Science degree.

MECHANICAL ENGINEERING TECHNOLOGY**Leading to the Degree of Bachelor of Engineering Technology**

The program in Mechanical Engineering Technology prepares the graduate to assume broad responsibilities related to the design, development, production, operation and installation of all kinds of machinery, engines, transportation equipment as well as boilers, furnaces, and heating or air conditioning equipment, which involve interactions of mechanical, hydraulic and thermodynamic forces. Employment opportunities are in industries producing mechanized and automated equipment, design and engineering organizations and in companies dealing primarily with manufacture and production.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken well in advance of the registration date.

FIRST YEAR

Course Number	Course	Q.H.
10.311, 10.312	College Algebra I, II	4
10.313, 10.314	College Trigonometry I, II	4
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12

SECOND YEAR

09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
10.321, 10.322, 10.323	Calculus II, III, IV	6
09.311, 09.312, 09.313	Mechanical and Structural Graphics I, II, III	6
30.504, 30.505, 30.506	English I, II, III	6

THIRD YEAR

02.301, 02.302, 02.303	Mechanics (Statics) I, II, III	6
02.341, 02.342, 02.343	Materials I, II, III	6
09.314, 09.315, 09.316	Production Drawing and Design I, II, III	6
	*Elective I, II, III	6

FOURTH YEAR

01.341, 01.342, 01.343	Fluid Mechanics I, II, III	6
02.304, 02.305, 02.306	Mechanics (Dynamics) I, II, III	6
02.321, 02.322, 02.323	Stress Analysis I, II, III	6
23.501, 23.502, 23.503	Western Civilization I, II, III	6

FIFTH YEAR

02.324, 02.325, 02.326	Advanced Stress Analysis I, II, III	6
02.351, 02.352, 02.353	Thermodynamics I, II, III	6
12.381, 12.382, 12.383	Nuclear Technology I, II, III	6
39.501, 39.502, 39.503	Economic Principles and Problems I, II, III	6

SIXTH YEAR

02.327, 02.328, 02.329	Mechanical Design I, II, III	6
02.354, 02.355, 02.356	Heat Transfer I, II, III	6
19.501, 19.502, 19.503	Psychology I, II, III	6
	*Elective I, II, III	6

SEVENTH YEAR

02.331, 02.332, 02.333	Mechanical Technology Lab. I, II, III	6
02.357, 02.358, 02.359	Heat Engineering I, II, III	6
	*Elective I, II, III	6

EIGHTH YEAR

02.361, 02.362, 02.363	Heat Technology Lab. I, II, III	6
30.507, 30.508, 30.509	Introduction to Literature I, II, III	6
	*Elective I, II, III	6

*Before registering for any electives, student should submit a proposed program of elective courses — preferably representing a minor field of concentration consistent with his personal career objectives — for approval by the Committee on Education.

10.324, 10.325, 10.326 Differential Equations I, II, III is recommended for all students planning advanced engineering technology subjects.

MECHANICAL-STRUCTURAL ENGINEERING TECHNOLOGY PROGRAM**Leading to the Degree of Bachelor of Engineering Technology**

The program in Mechanical-Structural Engineering Technology is interdisciplinary in that it prepares the graduate to assume responsibilities related to both the planning and construction of relatively static structures such as buildings, bridges, docks, etc., and also the design and production of dynamic machine tools, machinery, and other mechanical devices. The mechanical and structural content are integrated so as to be complementary and to provide a broad base for design problems of great variety. Employment opportunities lie in the architectural, construction, civil, and mechanical professions and companies.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken well in advance of the registration date.

FIRST YEAR

Course Number	Course	Q.H.
10.311, 10.312	College Algebra I, II	4
10.313, 10.314	College Trigonometry I, II	4
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12

SECOND YEAR

09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
10.321, 10.322, 10.323	Calculus II, III, IV	6
09.311, 09.312, 09.313	Mechanical and Structural Graphics I, II, III	6
30.504, 30.505, 30.506	English I, II, III	6

THIRD YEAR

01.301, 01.302, 01.303	Surveying I, II, III	6
02.301, 02.302, 02.303	Mechanics (Statics) I, II, III	6
09.314, 09.315, 09.316	Production Drawing and Design I, II, III	6
	*Elective I, II, III	6

FOURTH YEAR

01.321, 01.322, 01.323	Introduction to Structures I, II, III	6
02.304, 02.305, 02.306	Mechanics (Dynamics) I, II, III	6
02.321, 02.322, 02.323	Stress Analysis I, II, III	6
23.501, 23.502, 23.503	Western Civilization I, II, III	6

FIFTH YEAR

01.324, 01.325, 01.326	Structural Analysis I, II, III	6
01.341, 01.342, 01.343	Fluid Mechanics I, II, III	6
02.341, 02.342, 02.343	Materials I, II, III	6
39.501, 39.502, 39.503	Economic Principles and Problems I, II, III	6

SIXTH YEAR

01.331, 01.332, 01.333	Design of Structures I, II, III	6
02.324, 02.325, 02.326	Advanced Stress Analysis I, II, III	6
19.501, 19.502, 19.503	Psychology I, II, III	6
	*Elective I, II, III	6

SEVENTH YEAR

01.371, 01.372, 01.373	Reinforced Concrete Design I, II, III	6
02.327, 02.328, 02.329	Mechanical Design I, II, III	6
	*Elective I, II, III	6

EIGHTH YEAR

02.331, 02.332, 02.333	Mechanical Technology Lab. I, II, III	6
30.507, 30.508, 30.509	Introduction to Literature I, II, III	6
	*Elective I, II, III	6

* Before registering for any electives, student should submit a proposed program of elective courses — preferably representing a minor field of concentration consistent with his personal career objectives — for approval by the Committee on Education.

10.324, 10.325, 10.326 Differential Equations I, II, III is recommended for all students planning advanced engineering technology subjects.





ELECTRICAL ENGINEERING TECHNOLOGY PROGRAMS

Electrical Engineering deals with the design and operation of equipment and systems related to distribution, communications, data-processing and electrical control. Its major functions are: 1) the generation, transmission and distribution of electrical energy for light and power purposes; 2) the development and production of equipment for telephone, radio, television, radar and communication; 3) the design and construction of data-processing systems and analog or digital computers; and 4) the application of electrical and electronic devices in the control of processes and manufacture.

Employment opportunities for the Electrical Engineering Technology graduate are in public and private research laboratories, in engineering consulting groups dealing with industrial and plant applications, design organizations dealing with operation and manufacture, and in sales engineering.

The Electrical Engineering Technology program and related programs offered by Lincoln College are:

Associate in Engineering Degree

Bioelectronic Engineering Technology	page 86
Electrical Power Engineering Technology	page 87
Electronics Engineering Technology	page 88

Post—Associate Degree Certificate

Control Systems Engineering Technology	page 89
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Bachelor of Engineering Technology Degree

Electrical Engineering Technology	pages 90-91
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BIOELECTRONIC ENGINEERING TECHNOLOGY**Leading to the Degree of Associate in Engineering**

The program in Bioelectronic Engineering Technology prepares the graduate to assume responsibilities related to the design, installation, and operation of modern medical electronic devices used in the measurement, recording and analysis of anatomical, physiological, and biochemical functions in humans and animals. The curriculum builds heavily on electronics theory, chemistry and human physiology with emphasis on typical bioelectronic devices and their laboratory applications. Employment opportunities are in biological, chemical, physiological and pharmaceutical research laboratories; in clinics and hospitals in relation to medical diagnoses and patient care; as well as in industrial organizations concerned with the design, development and production of the equipment.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken well in advance of the registration date.

FIRST YEAR

Course Number	Course	Q.H.
10.311, 10.312	College Algebra I, II	4
10.313, 10.314	College Trigonometry I, II	4
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12

SECOND YEAR

03.301, 03.302, 03.303	Circuit Theory I, II, III	6
10.321, 10.322, 10.323	Calculus II, III, IV	6
12.311, 12.312, 12.313	*General Chemistry I, II, III	6
09.307, 09.308, 09.309	Electrical and Electronic Graphics I, II, III	6

THIRD YEAR

03.304, 03.306, 03.323	Circuit Theory IV, Electrical Measurements and Electronic Lab.	6
03.311, 03.312, 03.313	Electronics I, II, III	12
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6

FOURTH YEAR

03.351, 03.352, 03.353	Bioelectronic Devices I, II, III	6
03.357, 03.358, 03.359	Bioelectronic Lab. I, II, III	6
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
18.324, 18.325, 18.326	Anatomy and Physiology I, II, III	6

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, Bachelor of Engineering Technology, or Bachelor of Science degree.

*Student may elect 12.314, 12.315, 12.316 General Chemistry and Laboratory.

ELECTRICAL POWER ENGINEERING TECHNOLOGY**Leading to the Degree of Associate in Engineering**

The program in Electrical Power Engineering Technology prepares the graduate to assume responsibilities related to the design, installation, operation and maintenance of electrical machinery, power and control apparatus, and larger equipment employing heavy currents. The curriculum includes the generation, transmission and distribution of electrical energy for light and power, and the application and operation of electrical machinery in industry.

Employment opportunities are in power companies, public utilities, electrical manufacturing companies, consulting engineering firms, control equipment design organizations, and communications companies.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken well in advance of the registration date.

FIRST YEAR

Course Number	Course	Q.H.
10.311, 10.312	College Algebra I, II	4
10.313, 10.314	College Trigonometry I, II	4
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12

SECOND YEAR

03.301, 03.302, 03.303	Circuit Theory I, II, III	6
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
10.321, 10.322, 10.323	Calculus II, III, IV	6
09.307, 09.308, 09.309	Electrical and Electronic Graphics I, II, III	6

THIRD YEAR

03.304, 03.305, 03.306	Circuit Theory IV, V, Electrical Measurements	6
03.311, 03.312, 03.313	Electronics I, II, III	12
03.331, 03.332, 03.333	Energy Conversion I, II, III	6

FOURTH YEAR

03.334, 03.335, 03.336	Control Circuits I, II, III	6
03.337, 03.338, 03.339	Basic Power Systems I, II, III	12
03.341, 03.342, 03.343	Power and Control Labs. I, II, III	6

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, Bachelor of Engineering Technology, or Bachelor of Science degree.

ELECTRONICS ENGINEERING TECHNOLOGY**Leading to the Degree of Associate in Engineering**

The program in Electronic Engineering Technology prepares the graduate to assume responsibilities related to the design, development, and operation of communications, data-processing and electronic control equipment for applications in computers, military and space explorations and in automated industrial production equipment. Employment opportunities are in communications equipment, electrical manufacturing, data-processing and control equipment organizations, as well as other engineering oriented companies.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken well in advance of the registration date.

FIRST YEAR

Course Number	Course	Q.H.
10.311, 10.312	College Algebra I, II	4
10.313, 10.314	College Trigonometry I, II	4
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12

SECOND YEAR

03.301, 03.302, 03.303	Circuit Theory I, II, III	6
10.321, 10.322, 10.323	Calculus II, III, IV	6
11.321, 11.322, 11.323	Particles and Waves I, II, III	6
09.307, 09.308, 09.309	Electrical and Electronic Graphics I, II, III	6

THIRD YEAR

03.304, 03.306, 03.323	Circuit Theory IV, Electrical Measurements, Electronic Lab.	6
03.311, 03.312, 03.313	Electronics I, II, III	12
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6

FOURTH YEAR

03.314, 03.315, 03.316	Pulse Circuits I, II, III	6
03.317, 03.318, 03.319	Communications Engineering I, II, III	12
03.327, 03.328, 03.329	Advanced Electronic Lab. I, II, III	6

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, Bachelor of Engineering Technology, or Bachelor of Science degree.

CONTROL SYSTEMS ENGINEERING TECHNOLOGY**Leading to a Certificate**

The program in Control Systems Engineering Technology is designed to provide electrical and electronic background required in the development of control equipment and systems related to the age of automation. Practicing engineers who wish to avoid technological obsolescence may keep abreast of current control practices. The program presumes graduation from either Associate in Engineering degree programs in Electrical or Electronic Engineering Technology or Bachelor degree programs in a branch of engineering. A certificate will be awarded upon completion of 24 quarter hours of credit.

REQUIRED COURSES

Course Number	Course	Q.H.
03.361, 03.362, 03.363	Transients in Linear Systems I, II, III	6

BASIC COURSES

(May be taken concurrently with Transients in Linear Systems)

10.324, 10.325, 10.326	Differential Equations I, II, III	6
03.364, 03.365, 03.366	Advanced Circuit Theory I, II, III	6

ELECTIVE COURSES

(Require completion of Transients in Linear Systems)

03.367, 03.368, 03.369	Pulse and Digital Circuits I, II, III	6
03.381, 03.382, 03.383	Transistor Circuit Engineering I, II, III	6
03.371, 03.372, 03.373	Analog, Digital and Hybrid Computers I, II, III	6
03.374, 03.375, 03.376	Digital Systems I, II, III	6
03.377, 03.378, 03.379	Control Systems I, II, III	6
03.384, 03.385, 03.386	Transmission Lines and Microwave Circuits I, II, III	6

ELECTRICAL ENGINEERING TECHNOLOGY**Leading to the Degree of Bachelor of Engineering Technology**

The program in Electrical Engineering Technology prepares the graduate to assume broad responsibilities related to the design, development, operation, installation and production of a wide variety of electrical and electronic equipment concerned with the generation and utilization of electric energy, communications, data-processing, and industrial control. Employment opportunities are in public and private research laboratories, engineering consulting firms dealing with industrial and plant applications, design organizations concerned with operation and manufacture as well as installation and sales.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken well in advance of the registration date.

FIRST YEAR

Course Number	Course	Q.H.
10.311, 10.312	College Algebra I, II	4
10.313, 10.314	College Trigonometry I, II	4
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12

SECOND YEAR

03.301, 03.302, 03.303	Circuit Theory I, II, III	6
10.321, 10.322, 10.323	Calculus II, III, IV	6
09.307, 09.308, 09.309	Electrical and Electronic Graphics I, II, III	6
30.504, 30.505, 30.506	English I, II, III	6

THIRD YEAR

03.304, 03.305, 03.306	Circuit Theory IV, V, and Electrical Measurements	6
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
10.324, 10.325, 10.326	Differential Equations I, II, III	6
11.321, 11.322, 11.323	Particles and Waves I, II, III	6

FOURTH YEAR

03.311, 03.312, 03.313	Electronics I, II, III	12
03.331, 03.332, 03.333	Energy Conversion I, II, III	6
03.324, 03.325, 03.323	Circuits Laboratory I, II and Electronic Lab.	6

FIFTH YEAR

03.317, 03.318, 03.319	Communication Engineering I, II, III	12
23.501, 23.502, 23.503	Western Civilization I, II, III	6
03.361, 03.362, 03.363	Transients in Linear Systems I, II, III	6

SIXTH YEAR

03.327, 03.328, 03.329	Advanced Electronic Lab. I, II, III	6
39.501, 39.502, 39.503	Economic Principles and Problems I, II, III	6
03.371, 03.372, 03.373	Analog, Digital and Hybrid Computers I, II, III	6
	*Elective I, II, III	6

SEVENTH YEAR

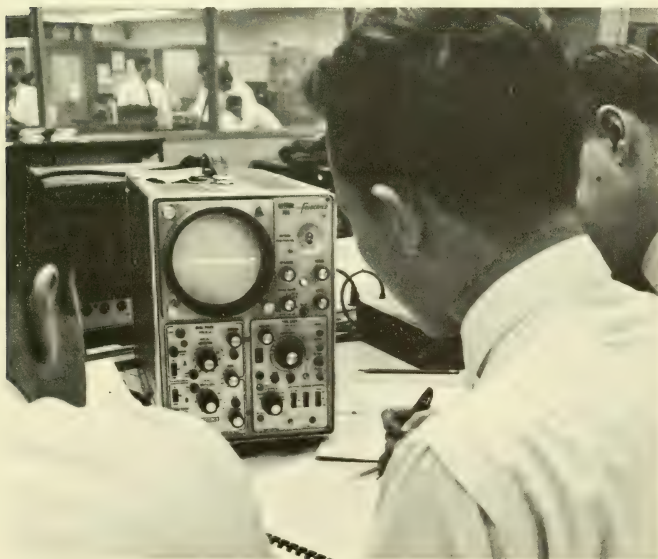
19.501, 19.502, 19.503	Psychology I, II, III	6
03.377, 03.378, 03.379	Control Systems I, II, III	6
	*Elective I, II, III	6

EIGHTH YEAR

30.507, 30.508, 30.509	Introduction to Literature I, II, III	6
	*Elective I, II, III	6
	*Elective I, II, III	6

* Before registering for any electives, student should submit a proposed program of elective courses — preferably representing a minor field of concentration consistent with his personal career objectives — for approval by the Committee on Education.

10.324, 10.325, 10.326 Differential Equations I, II, III is recommended for all students planning advanced engineering technology subjects.



INDUSTRIAL TECHNOLOGY PROGRAM

Industrial Technology is concerned with the application of scientific methods to problems in the field of production management involving the effective use of men, materials, machinery, and money.

Industrial Technology programs are intended to meet the demand for men and women trained to assume administrative responsibility in a technical industry. Although based upon engineering or science technology, the curriculum contains business, social science, and liberal content courses and is designed to prepare for positions of administrative or supervisory, rather than highly specialized technological responsibility.

Upon graduation, the industrial technologist may find his way into such factory staff department as methods engineering, production planning and control, wage administration, quality control, and time study. Additional opportunities are in cost accounting, statistical analysis, sales engineering, and safety engineering.

Students interested in pursuing a program closely related to the more traditional Industrial Engineering Technology should complete the Associate in Engineering degree program in Mechanical Engineering Technology, after which they should continue in the Industrial Technology program.

In conjunction with University College, Lincoln College offers the following program:

Bachelor of Science Degree

INDUSTRIAL TECHNOLOGY**Leading to the Degree of Bachelor of Science**

The Industrial Technology curriculum combines fundamental courses in one of several areas of engineering or science technology with an integrated program in management, the humanities, and the social sciences to provide background for those who aspire to positions of managerial responsibility where technical knowledge is required.

The curriculum is offered by University College in conjunction with Lincoln College. Graduates of Lincoln College or other technical schools who have been awarded the Associate degree may be granted up to 96 hours of credit toward the Bachelor of Science degree. The technology requirements may also be earned by satisfactory completion of equivalent technology courses in an accredited engineering college or technical institute.

The total requirements for the degree are 174 quarter hours distributed as follows:

	Q.H.
Engineering or Science Technology Courses	96
Liberal Content — Required	36
39.501, 39.502, 39.503 Economic Principles and Problems I, II, III	6
21.501, 21.502, 21.503 Sociology I, II, III	6
30.504, 30.505, 30.506 English I, II, III	6
30.507, 30.508, 30.509 Introduction to Literature I, II, III	6
19.501, 19.502, 19.503 Psychology I, II, III	6
23.501, 23.502, 23.503 Western Civilization I, II, III	6
Management Courses — Required	34
45.501, 45.502, 45.503 Management and Organization I, II, III	6
45.570, 45.571, 45.572 Electronic Data Processing I, II, III	6
45.541, 45.542, 45.543 Law I, II, III	6
41.501, 41.502, 41.503 Accounting Principles I, II, III	6
45.510 Labor—Management Relations	2
39.510 Statistics for Quality Control	2
45.563 Management of Quality Control	2
45.561, 45.562 Statistical Quality Control I, II	4
Electives	8
Total Hours Required for Degree	174



Description of Courses

On the pages which follow is a numerical and descriptive listing of courses offered in the several curricula of Lincoln College. Although not all courses are offered every year, all will be offered during the normal period of each student's curriculum. The term "prerequisite" indicates a course that must be taken before undertaking the advanced course to which it applies.

A "quarter hour" equals approximately three clock hours of work (ordinarily, one hour of class and two hours of preparation a week for a quarter of 12 weeks' duration). Laboratory and drawing courses normally require fewer hours of outside preparation and therefore carry less credit than lecture courses.

Abbreviations

Prereq.—Prerequisite
Cl.—Class hours

Lab.—Laboratory hours
Q.H.—Quarter hours

Policy on Changes of Program

Lincoln College reserves the right to withdraw, modify, or add to the courses offered or to change the order or content of courses in any curriculum.

The University further reserves the right to change the requirements for graduation, tuition, and fees charged, and other regulations. However, no change in tuition and fees at any time shall become effective until the school year following that in which it is announced.

Any changes which may be made from time to time relative to the above policy shall be applicable to all students in the school, college, or department concerned, including former students who may re-enroll.



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Civil Engineering Technology

01.301 Surveying I Prereq. 10.314 2 Cl., 2 Q.H.
Basic surveying principles; theory of measurements; basic traverse computations.

01.302 Surveying II Prereq. 01.301 2 Cl., 2 Q.H.
Stadia principles and topography; simple, compound and vertical curves.

01.303 Surveying III Prereq. 01.302 2 Cl., 2 Q.H.
Spiral easement curves, earthwork computations and the solution of the Mass Diagram.

01.304 Advanced Surveying I Prereq. 01.303 1 Cl., 2 Lab., 2 Q.H.
Introduction to observations for latitude, time azimuth including basic spherical trigonometry.

01.305 Advanced Surveying II Prereq. 01.304 1 Cl., 2 Lab., 2 Q.H.
Precise leveling, triangulation and base line measurements. Use of the Geodimeter and Tellurometer.

01.303 Surveying III Prereq. 01.302 2 Cl., 2 Q.H.
Basic principles of photogrammetry and map making from aerial photographs. Map projections.

01.307 Legal Aspects of Surveying I Prereq. 01.303
2 Cl., 2 Q.H.
Surveyor as an expert witness with emphasis on his knowledge of measurements; easements. Registry of Deeds procedure and how land is sold.

01.308 Legal Aspects of Surveying II Prereq. 01.307
2 Cl., 2 Q.H.
Deeds and their essential elements, descriptions and water rights.

01.309 Legal Aspects of Surveying III Prereq. 01.308
2 Cl., 2 Q.H.
Land court procedure and the subdivision control law.

01.311 Transportation Engineering I Prereq. 01.303
2 Cl., 2 Q.H.
Engineering considerations in the planning and construction of modern highways and highway routing.

01.312 Transportation Engineering II Prereq. 01.311
2 Cl., 2 Q.H.
Rates of grade, superelevation, flexible and rigid pavements and other features of highway design.

01.313 Transportation Engineering III

Prereq. 01.312

2 Cl., 2 Q.H.

Traffic flow and traffic control. Computer applications to transportation problems.

01.321 Introduction to Structures I

Prereq. 09.313 and 02.303

1 Cl., 2 Lab., 2 Q.H.

Framing plans and details for steel structures.

01.322 Introduction to Structures II

Prereq. 01.321

1 Cl., 2 Lab., 2 Q.H.

Structural shop drafting and the evaluation of load capacities of rivets, welds and bolts for structural connections using the AISC code.

01.323 Introduction to Structures III

Prereq. 01.322

1 Cl., 2 Lab., 2 Q.H.

Design and detailing of joints including standard connections, seats and brackets.

01.324 Structural Analysis I

Prereq. 02.323 2 Cl., 2 Q.H.

Reactions, shears, bending moments and forces developed by loads on beams and trusses. Analytical and graphical methods.

01.325 Structural Analysis II

Prereq. 01.324 2 Cl., 2 Q.H.

Influence lines for beams, girders and trusses. Solutions for forces from moving load systems on statically determinate structures.

01.326 Structural Analysis III

Prereq. 01.325 2 Cl., 2 Q.H.

Introduction to classical methods for deflection solutions of beams and trusses. Methods of solving statically indeterminate structures.

01.327 Advanced Structural Analysis I

Prereq. 01.326 2 Cl., 2 Q.H.

Analysis of Indeterminacy and Instability. Analysis of statically indeterminate structures using Castigliano, Virtual Work, method of deflections and the neutral point method.

01.328 Advanced Structural Analysis II

Prereq. 01.327 2 Cl., 2 Q.H.

Analysis of statically indeterminate structures using the column analogy, moment area, elastic weights and conjugate structures.

01.329 Advanced Structural Analysis III

Prereq. 01.328 2 Cl., 2 Q.H.

Analysis of statically indeterminate structures using Williot-Mohr, slope deflection and moment distribution.

01.331 Design of Structures I

Prereq. 01.323 and 02.323

2 Cl., 2 Q.H.

Design of steel members in structural frames. Tension, compression, bending and eccentrically loaded members.

01.332 Design of Structures II

Prereq. 01.331 2 Cl., 2 Q.H.

Design of plate girders, highway bridge decks, and roof framing systems.

01.333 Design of Structures III Prereq. 01.332 2 Cl., 2 Q.H.
Composite design in bridges and buildings. Introduction to plastic design methods in steel.

01.334 Advanced Structural Design I Prereq. 01.326, 01.333, 01.373
2 Cl., 2 Q.H.

Design of continuous frames in structural steel moment resistant connections and column bases.

01.335 Advanced Structural Design II Prereq. 01.334 2 Cl., 2 Q.H.
Design of continuous frames in reinforced concrete. Introduction to prestressed concrete member design.

01.336 Advanced Structural Design III Prereq. 01.335 2 Cl., 2 Q.H.
Design of foundations for structures. Spread footings, combined footings, mats and pile foundations.

01.341 Fluid Mechanics I Prereq. 02.303 2 Cl., 2 Q.H.
Hydrostatics; principles governing fluids at rest; pressure measurement; hydrostatic forces on submerged areas and objects; simple dams; fluids in moving vessels; hoop tension.

01.342 Fluid Mechanics II Prereq. 01.341 2 Cl., 2 Q.H.
Fluid flow in pipes under pressure; fluid energy, power and friction loss; Bernoulli's Theorem; flow measurement.

01.343 Fluid Mechanics III Prereq. 01.342 2 Cl., 2 Q.H.
Pipe networks and reservoir systems; flow in open channels; uniform flow; energy, friction loss, minor losses, velocity distribution, alternate stages of flow, critical flow; non-uniform flow; accelerated and retarded flow, hydraulic jump and waves.

01.351 Municipal and Sanitary Engineering I
Prereq. 01.343 and 12.313 2 Cl., 2 Q.H.
Principles of water supply engineering; population forecasting, quality and quantity of water for various uses. Water-treatment processes.

01.352 Municipal and Sanitary Engineering II Prereq. 01.351
2 Cl., 2 Q.H.
Collection and disposal of sewage and storm water. Modern methods of treatment and sewage-plant operation.

01.353 Municipal and Sanitary Engineering III Prereq. 01.352
1 Cl., 2 Lab., 2 Q.H.
Layout and design of water-treatment and sewage treatment plants. Instrumentation; mechanical and electrical equipment.

01.361 Materials and Soil Mechanics I Prereq. 02.303 2 Cl., 2 Q.H.
Physical properties of bituminous and Portland cement materials of construction. Lectures supplemented with some laboratory exposure.

01.362 Materials and Soil Mechanics II Prereq. 01.361 2 Cl., 2 Q.H.
Soil classification, identification, properties, and the phase relationships.

01.363 Materials and Soil Mechanics III Prereq. 01.362 2 Cl., 2 Q.H.
Shear strength and consolidation theory. Applications of soil properties in determining lateral and bearing pressures.

01.371 Reinforced-Concrete Design I Prereq. 02.323 2 Cl., 2 Q.H.
Design of bending members in reinforced concrete, using elastic and ultimate-strength theories.

01.372 Reinforced-Concrete Design II Prereq. 01.371 2 Cl., 2 Q.H.
Design of axially and eccentrically loaded columns by elastic and ultimate strength principles.

01.373 Reinforced-Concrete Design III Prereq. 01.372 2 Cl., 2 Q.H.
Reinforced-concrete design of basic structures including consideration of continuity.

Mechanical Engineering Technology

02.301 Mechanics (Statics) I Prereq. 10.320 2 Cl., 2 Q.H.
Forces, moments, couples, statics of particles and rigid bodies in two and three dimensions.

02.302 Mechanics (Statics) II Prereq. 02.301 2 Cl., 2 Q.H.
Distributed forces — external and internal. First moments and centroids. Analysis of structures — trusses, frames and machines.

02.303 Mechanics (Statics) III Prereq. 02.302 2 Cl., 2 Q.H.
Friction, second moments and virtual work.

02.304 Mechanics (Dynamics) I Prereq. 02.303 2 Cl., 2 Q.H.
Kinematics of particles — rectilinear and curvilinear motion of dynamic particles — force, mass and acceleration, work and energy.

02.305 Mechanics (Dynamics) II Prereq. 02.304 2 Cl., 2 Q.H.
Kinematics and dynamics of rigid bodies — force mass and acceleration.

02.306 Mechanics (Dynamics) III Prereq. 02.305 2 Cl., 2 Q.H.
Dynamics of rigid bodies — work and energy, impulse and momentum. Introduction to mechanical vibration.

02.321 Stress Analysis I Prereq. 02.303 2 Cl., 2 Q.H.
Stress and deformation; mechanical properties of materials; allowable stresses and factor of safety; axially loaded indeterminate members; effects of temperature on stresses and strains; thin cylinders and spheres. Riveted and welded joints.

- 02.322 Stress Analysis II** Prereq. 02.321 2 Cl., 2 Q.H.
Shear and bending moment in beams; stresses in beams; design of beams; curvature of beams.
- 02.323 Stress Analysis III** Prereq. 02.322 2 Cl., 2 Q.H.
Determinate and indeterminate beam deflections and reactions by integration and moment — area methods; theorem of three moments.
- 02.324 Advanced Stress Analysis I** Prereq. 02.323 2 Cl., 2 Q.H.
Energy absorption and resilience; deflections of determinate and indeterminate beams by moment distribution and energy methods; torsional stresses and strains; power transmissions; dynamic loading.
- 02.325 Advanced Stress Analysis II** Prereq. 02.324 2 Cl., 2 Q.H.
Combined loading; principle stresses; Mohr's circle for stresses and strains in two and three dimensions; modes of failure; theories of failure.
- 02.326 Advanced Stress Analysis III** Prereq. 02.325 2 Cl., 2 Q.H.
Curved beams; shear center of beams; thick cylinders; columns.
- 02.327 Mechanical Design I** Prereq. 02.306, 02.323 2 Cl., 2 Q.H.
Materials, properties and selection of materials; stress concentrations; screws, fasteners and joints; press, shrink and friction joints; cylinder heads and cover plates, keys and pins.
- 02.328 Mechanical Design II** Prereq. 02.327 2 Cl., 2 Q.H.
Torsion of non-circular cross-sections; springs; stresses and deformation; unsymmetrical bending of beams; fatigue; fluctuating stresses for ductile and brittle materials; stresses and power transmission of spur gears.
- 02.329 Mechanical Design III** Prereq. 02.328 2 Cl., 2 Q.H.
Stresses and power transmission of helical, bevel, and worm gears; lubrication and journal bearings; antifriction bearings; shafts; clutches and brakes.
- 02.331 Mechanical Technology Laboratory I** Prereq. 02.323 and 02.343 3 Lab., 2 Q.H.
Tests on instrumentation and measurement of standard characteristics of force, length, area, speed and power. Simple testing of materials.
- 02.332 Mechanical Technology Laboratory II** Prereq. 02.331 and 02.325 or Concurrently 3 Lab., 2 Q.H.
Flow of compressible and incompressible fluids. Advanced testing of structural materials.
- 02.333 Mechanical Technology Laboratory III** Prereq. 02.332 and 02.325 or Concurrently 3 Lab., 2 Q.H.
Aerodynamic and vibration testing. Experimental stress analysis projects.

02.337 Mechanical Vibrations I Prereq. 02.306, 10.326 2 Cl., 2 Q.H.
Elements of vibrating systems, one degree of freedom (undamped free and forced vibration from Newton's law of motion and energy methods.) Natural frequencies. Damped free and forced vibration. Impedance and mobility.

02.338 Mechanical Vibrations II Prereq. 02.337 2 Cl., 2 Q.H.
Systems with more than one degree of freedom. Influence coefficients, Lagrange's equations, generalized coordinates, vibration absorber.

02.339 Mechanical Vibrations III Prereq. 02.338 2 Cl., 2 Q.H.
Natural frequencies by Rayleigh methods and Holzer methods for multi-degree of freedom. Application problems with combined rotation and translation. Laplace transforms and electro-mechanical analogs.

02.341 Materials I 2 Cl., 2 Q.H.
Lectures and demonstrations on: testing and failure of metals, alloying and hardening metals; extraction of metals from their ores; organic and inorganic materials, concrete, plastics, rubber, wood.

02.342 Materials II Prereq. 02.341 2 Cl., 2 Q.H.
General metallurgical information covering theoretical aspects of properties, of metals as well as processing of the metals. Structure, mechanical properties, equilibrium diagrams, hardening and heat treatment.

02.343 Materials III Prereq. 02.342 2 Cl., 2 Q.H.
Theoretical and practical applications of secondary metal fabrication; including welding, powder metallurgy. Cutting-tool principles, gauging and measurements.

02.351 Thermodynamics I Prereq. 11.316 2 Cl., 2 Q.H.
General theory of heat and matter; laws of thermodynamics; energy-transformation principles and availability of energy; properties and processes for pure substances and ideal gases.

02.352 Thermodynamics II Prereq. 02.351 2 Cl., 2 Q.H.
Thermodynamic properties and processes of liquids and vapors; tables and charts; mixtures of fluids; theory of gas and vapor flow through orifices and nozzles.

02.353 Thermodynamics III Prereq. 02.352 2 Cl., 2 Q.H.
Vapor and gas cycle analysis; fuels and combustion in steam boilers; theory of vapor engines and analysis of types of actual engines used compression of gases and vapors; internal combustion engines.

02.354 Heat Transfer I Prereq. 02.353 2 Cl., 2 Q.H.
An introduction to the modes of heat transfer and fundamental laws of conduction; steady-state conduction in composite sections.

02.355 Heat Transfer II Prereq. 02.354 2 Cl., 2 Q.H.
Natural and forced convection; electrical and thermal analogies. Kirchhoff's law of radiation heat transfer between simple bodies.

- 02.356 Heat Transfer III** Prereq. 02.355 2 Cl., 2 Q.H.
Combined conduction and convection heat transfer; mean temperature differences and overall heat transfer coefficients. Applications to engineering programs.
- 02.357 Heat Engineering I (Refrigeration)** Prereq. 02.353
2 Cl., 2 Q.H.
Principles of gas compression, analysis of vapor compression, refrigeration systems, low temperature refrigeration cycles and absorption refrigeration systems.
- 02.358 Heat Engineering II (Air Conditioning)** Prereq. 02.353
2 Cl., 2 Q.H.
Air conditioning principles including psychometrics and heat pumps. Calculation of heating and cooling loads in accordance with A.S.H.R.A.E. practices.
- 02.359 Heat Engineering III (Turbines)** Prereq. 02.353
2 Cl., 2 Q.H.
Design and performance of steam and gas turbines; spark-ignition and compression-ignition engines; overall power-plant design and performance.
- 02.361 Heat Technology Laboratory I** Prereq. 02.353 3 Lab., 2 Q.H.
Experiments concerning instrumentation and measurement of steam, air and liquid flow and temperature.
- 02.362 Heat Technology Laboratory II** Prereq. 02.361, 02.354
and 02.357 3 Lab., 2 Q.H.
Performance and operation of heat power devices such as spark-ignition and compression-ignition engines. Simple heat transfer refrigeration and air conditioning experiments.
- 02.363 Heat Technology Laboratory III** Prereq. 02.362; 02.356
or concurrently and 02.359 or
concurrently 3 Lab., 2 Q.H.
Tests illustrating the application of heat power fundamentals to gas and steam turbines, condensers, combustion, and power plants.

Electrical Engineering Technology

- 03.301 Circuit Theory I** Prereq. 10.320 and 11.313 2 Cl., 2 Q.H.
Ohm's law, Kirchoff's current and voltage laws, equivalent resistances and sources, Mesh and Nodal analysis, network theorems, two-port networks and power relations all with respect to direct currents.
- 03.302 Circuit Theory II** Prereq. 03.301 2 Cl., 2 Q.H.
Energy storage, singularity functions, response of R, L and C elements to singularities, response of R-L and R-C circuits to singularities.

- 03.303 Circuit Theory III** Prereq. 03.302 2 Cl., 2 Q.H.
Complex algebra, phasors, frequency domain, mutual inductance, transformers, steady-state a-c theory, driving-point and transfer impedances, power and energy in a-c circuits.
- 03.304 Circuit Theory IV** Prereq. 03.303 2 Cl., 2 Q.H.
RLC networks and their responses to excitations. Fourier series, numerical methods, frequency response, amplitude and phase versus frequency.
- 03.305 Circuit Theory V** Prereq. 03.304 2 Cl., 2 Q.H.
Consideration of balanced and unbalanced polyphase power circuits; symmetrical components, harmonic analysis.
- 03.306 Electrical Measurements** Prereq. 03.304 2 Cl., 2 Q.H.
Measurement of voltage, current, power, resistance, capacitance, inductance, impedance, frequency tube characteristics, etc. Direct and substitution measurements. Evaluation of measured data — standard deviation and tolerance limits, instrument calibrations — effect of residual impedance.
- 03.311 Electronics I** Prereq. 03.303 4 Cl., 4 Q.H.
Semiconductor, vacuum, and gas diodes. Transistors and tubes as amplifying devices. Graphical analysis of basic amplifiers. d-c and a-c load lines. Transistor biasing techniques.
- 03.312 Electronics II** Prereq. 03.311 4 Cl., 4 Q.H.
Transistor small-signal low-frequency models, a-c equivalent circuits, low-frequency amplifier circuits. Frequency effects in audio amplifiers. Untuned voltage amplifiers.
- 03.313 Electronics III** Prereq. 03.312 4 Cl., 4 Q.H.
Continuation of transistor circuits, feedback amplifiers, low-frequency large-signal amplifiers, power supplies and filters, voltage regulation. Frequency effects in audio amplifiers and low-frequency large-signal amplifiers.
- 03.314 Pulse Circuits I** Prereq. 03.313 2 Cl., 2 Q.H.
Study of wideband amplifiers including compensation, rise time and sag. Review of semiconductor diodes. Study of wave shaping circuitry including clippers, clampers, slicers. Review of d-c charging circuits.
- 03.315 Pulse Circuits II** Prereq. 03.314 2 Cl., 2 Q.H.
Familiarization with binary notation and Boolean Algebra. Examine operation of OR, AND, NOT, NAND, and NOR circuits. Study of details of shift register and diode matrix. Fundamentals of Multivibrators.
- 03.316 Pulse Circuits III** Prereq. 03.315 2 Cl., 2 Q.H.
Examine design of multivibrator ckts, bistable, astable and monostable. Study blocking oscillators, counting and timing ckts. Synchronization, voltage time-base generators, Miller integrator, bootstrap ckt, etc.

- 03.317 Communication Engineering I** Prereq. 03.313 4 Cl., 4 Q.H.
Review of linear circuits including Thevenin Theorem, Xirchoff's Laws, etc. Review of transistor "black-box" equivalent circuits. Study of class B and C amps. Review of Fourier Analysis. Problem solution using small signal transistor amplifiers.
- 03.318 Communication Engineering II** Prereq. 03.317 4 Cl., 4 Q.H.
Study of RLC amplifiers. Theory of oscillators including RLC, RC, and xtal. Single and double-tuned cascaded amplifiers, coupled-coil theory, noise in electrical circuits.
- 03.319 Communication Engineering III** Prereq. 03.318 4 Cl., 4 Q.H.
Theory of amplitude and frequency modulation. Study of detector circuitry. Familiarization with basic modulation circuits. Study of general AM and FM receiver, transmitter block diagrams.
- 03.323 Electronic Laboratory** Prereq. 03.312 3 Lab., 2 Q.H.
Experiments dealing with laboratory equipment techniques, transistor and crystal-diode characteristics, the impedance bridge, the Q-Meter, coils with iron cores, filter circuits, vacuum and semi-conductor diodes, power supplies including the regulated type, triode and pentode vacuum tubes, thyratrons, silicon controlled rectifiers, resistance-coupled amplifiers using transistors.
- 03.324 Circuits Laboratory I** Prereq. 03.304 and 03.306 or concurrently 3 Lab., 2 Q.H.
Experimentation in electric circuit theory. Instrumentation; verification of circuit theorems; linear and non-linear devices.
- 03.325 Circuits Laboratory II** Prereq. 03.324 3 Lab., 2 Q.H.
Further experimentation in electric circuits. Response to impulses; network parameters and synthesis; terminal characteristics of active devices.
- 03.327 Advanced Electronic Laboratory I** Prereq. 03.323 and 03.313 3 Lab., 2 Q.H.
Experiments dealing with transistor amplifiers with negative feedback, directly coupled and difference amplifiers, Class B audio amplifier with transistors, push-pull amplifiers, drivers and distortion measurements. Vacuum tube and transistor type video amplifiers. Class C RF amplifiers and frequency doublers, audio and radio frequency oscillators. Class B linear RF amplifiers and grid-modulated amplifiers, clipping and clamping circuits, transients and square-wave testing of audio amplifiers.
- 03.328 Advanced Electronic Laboratory II** Prereq. 03.327 3 Lab., 2 Q.H.
Experiments dealing with plate modulation of a class C amplifier, the diode detector, basic timing circuits, crystal oscillators, networks in FM and television equipment, pulse and counter circuits and frequency dividers, sawtooth generators, astable (free-running) multivibrators, the double-tuned transformer coupling circuit, logic gates, frequency modulation detectors, analog computers.
- 03.329 Advanced Electronic Laboratory III** Prereq. 03.328 3 Lab., 2 Q.H.
Spectral studies of FM and PM waves, amplitude limiters. The balanced modulators and single sideband generators. Binary adders, registers and counters, testing of a radio receiver, television receiver demonstrator. Pulse forming and delay lines, slotted lines and a series of five microwave experiments.

03.331 Energy Conversion I Prereq. 03.303 and 10.323 2 Cl., 2 Q.H.
Generalized theory of rotating energy conversion devices. Consideration of the multiply excited direct-current machine. Control of speed; special machines.

03.332 Energy Conversion II Prereq. 03.331 2 Cl., 2 Q.H.
Transformer fundamentals. The single-phase transformer; no-load and load characteristics; equivalent circuits. Three-phase transformers, the polyphase-induction motor; equivalent circuits.

03.333 Energy Conversion III Prereq. 03.332 2 Cl., 2 Q.H.
The synchronous machine; alternator characteristics involving synchronous impedance, power angle and voltage regulation. The synchronous motor. Dynamic properties as well as steady-state operation of rotating machines will be emphasized.

03.334 Control Circuits I Prereq. 03.313 and 03.333 2 Cl., 2 Q.H.
Elements of control circuit devices; transfer functions; flow charts; frequency response.

03.335 Control Circuits II Prereq. 03.334 2 Cl., 2 Q.H.
Consideration of control systems; stability criteria; dynamic analysis; compensation.

03.336 Control Circuits III Prereq. 03.335 2 Cl., 2 Q.H.
Industrial control circuits; speed and voltage control; power rectifiers.

03.337 Basic Power Systems I Prereq. 03.333 4 Cl., 4 Q.H.
Consideration of power transmission lines; line constants; current, voltage and power relations; introduction to electric-power distribution loads, feeders and substations; voltage regulation theory and applications.

03.338 Basic Power Systems II Prereq. 03.337 4 Cl., 4 Q.H.
Consideration of symmetrical and unsymmetrical faults; protective devices — application and coordination; power flow in electric circuits; steady-state power limitations of systems; stability criteria.

03.339 Basic Power Systems III Prereq. 03.338 4 Cl., 4 Q.H.
Computer applications to power systems with emphasis on load-flow studies and basic ideas of system planning.

03.341 Power and Controls Laboratory I Prereq. 03.333 and 03.334
or concurrently 4 Lab., 2 Q.H.
Experimentation on measurement techniques, basic devices and circuits (including power circuits), transformers. Power measurements.

03.342 Power and Controls Laboratory II Prereq. 03.341
4 Lab., 2 Q.H.
Experimentation on the steady-state and dynamic characteristics of rotating machines.

03.343 Power and Controls Laboratory III Prereq. 03.342
and 03.335 4 Lab., 2 Q.H.
Experimentation on control devices, systems including servomechanisms, voltage and speed control systems, power rectifiers.

03.351 Bioelectronic Engineering I Prereq. 03.313 2 Cl., 2 Q.H.
Transducers, relating body functions and biomedical reactions to electronic signals. Optics and optical components including mirror lenses, prisms and gratings. Diffraction and refraction of light into spectral components and spectra.

03.352 Bioelectronic Engineering II Prereq. 03.351 2 Cl., 2 Q.H.
Operational amplifier design and utilization, special power supply design. Chromatography and design of chromatography systems. Spectrophotometry radiation counting equipment and Ph measurement equipment related to chromatography. The electrocardiograph, electroencephalograph and related physiological equipment will be discussed.

03.353 Bioelectronic Engineering III Prereq. 03.352 2 Cl., 2 Q.H.
Blood pressure and flow measurement including ultrasonic devices, centrifugation and ultracentrifugation equipment as well as amino acid analyzers. Nerve-conduction apparatus and techniques. Professional specialists in the field will lecture on special topics.

03.357 Bioelectronic Laboratory I Prereq. 03.313 3 Lab., 2 Q.H.
Experiments in electronic circuitry including audio amplifiers, differential amplifiers, power amplifiers, oscillators and related circuits. Experiments in optics covering lenses, mirrors, prisms, gratings, and spectra. Radiation experiments.

03.353 Bioelectronic Engineering II Prereq. 03.357 3 Lab., 2 Q.H.
Special design experiments on the optical bench related to spectrophotometry, experiments with optical and electrophotical system. Design of detection and amplification, monitoring systems.

03.359 Bioelectronic Laboratory III Prereq. 03.358 3 Lab., 2 Q.H.
Experiments and open discussion centered around bioelectronic systems including electrocardiogram, electroencephalograph, amino acid analyzers, Ph measurement and titration apparatus, centrifuges and ultracentrifuges as well as radioactive sample changers.

03.361 Transients in Linear Systems I Prereq. 10.324 or concurrently,
03.304 or Equivalent 2 Cl., 2 Q.H.
Methods employed in writing integrodifferential equations for electrical, mechanical, and electromechanical systems. Introduction to singularity functions and convolution.

03.362 Transients in Linear Systems II Prereq. 10.325 or concurrently,
03.361 2 Cl., 2 Q.H.
Network topology and duality, introduction to the methods of transformation calculus and complex frequency concepts. Signal analysis in the frequency domain. Fourier series, Fourier and Laplace transform methods.

03.363 Transients in Linear Systems III Prereq. 10.326 or concurrently,
03.362 2 Cl., 2 Q.H.
A varied selection of circuit problems are solved using Laplace transforms.

- 03.364 Advanced Circuit Theory I** Prereq. 03.363 2 Cl., 2 Q.H.
General analysis of networks by loop current and node voltage variables.
- 03.365 Advanced Circuit Theory II** Prereq. 03.364 2 Cl., 2 Q.H.
The two terminal pair conventional circuit theory.
- 03.366 Advanced Circuit Theory III** Prereq. 03.365 2 Cl., 2 Q.H.
Discussion of the necessary and sufficient conditions for the physical realizing of impedance functions; Foster and Cauer forms.
- 03.367 Pulse and Digital Circuits I** Prereq. 03.363 2 Cl., 2 Q.H.
Principle and techniques of pulse-forming circuits; applications to radar and digital computers emphasizing semiconductors.
- 03.368 Pulse and Digital Circuits II** Prereq. 03.367 2 Cl., 2 Q.H.
Analysis and design of gates, matrix switches and multivibrators. Integrated circuits.
- 03.369 Pulse and Digital Circuits III** Prereq. 03.368 2 Cl., 2 Q.H.
Analysis and design of blocking oscillators, sweep generators and delay lines.
- 03.371 Analog, Digital and Hybrid Computers I** Prereq. 10.325
2 Cl., 2 Q.H.
Theory and operation of analog computers. Amplitude scaling and time scaling on the analog computer and application of the analog computer to the solution of linear and non-linear differential equations.
- 03.372 Analog, Digital and Hybrid Computers II** Prereq. 03.371
2 Cl., 2 Q.H.
Introduction to the field of digital computer design. Topics include general computer organization, number systems and number representations, design characteristics of major computer units, Boolean Algebra applications to computer design.
- 03.373 Analog, Digital and Hybrid Computers III** Prereq. 03.372
2 Cl., 2 Q.H.
Survey of the present state-of-the-art of hybrid computers. Problem areas unique to hybrid computers such as interface, analog-to-digital and digital-to-analog conversion will also be discussed. Hybrid computer programming techniques. Direct digital process control computers.
- 03.374 Digital Systems I** Prereq. 03.316 2 Cl., 2 Q.H.
Basic concepts of Boolean Algebra. Switching components. Analysis and synthesis of combinational circuits. Analysis and synthesis of sequential circuits. Examples of applications.
- 03.375 Digital Systems II** Prereq. 03.374, 03.319 2 Cl., 2 Q.H.
Data acquisition techniques. Data decommutation techniques relative to communications systems. Aerospace telemetry systems. Analog and digital data reduction. Real time data processing.
- 03.376 Digital Systems III** Prereq. 03.375 2 Cl., 2 Q.H.
Residue number systems. Threshold logic concepts. Advanced digital system techniques with applications to complex systems.

03.377 Control Systems I Prereq. 03.363 2 Cl., 2 Q.H.
Analysis of linear servomechanisms under both transient and steady-state conditions.

03.378 Control Systems II Prereq. 03.377 2 Cl., 2 Q.H.
Laplace transforms used in the formulation of block diagrams and transfer function. System stability.

03.379 Control Systems III Prereq. 03.378 2 Cl., 2 Q.H.
Treatment of Nyquist criteria, and Bode diagram methods for systems evaluation.

03.381 Transistor-Circuit Engineering I Prereq. 03.363 2 Cl., 2 Q.H.
Introduction to semiconductor physics which avoids the use of higher mathematics. Field effect transistors included.

03.382 Transistor-Circuit Engineering II Prereq. 03.381 2 Cl., 2 Q.H.
Treatment of both equivalent circuit and the graphical methods of circuit analysis.

03.383 Transistor-Circuit Engineering III Prereq. 03.382 2 Cl., 2 Q.H.
Audio and power amplifiers; r-f and pulse circuit applications. Also integrated circuit material.

03.384 Transmission Line and Microwave Theory I Prereq. 03.304, 10.326 2 Cl., 2 Q.H.
Distributed constants and traveling waves on transmission lines with emphasis on space-time diagrams. Differential equations of the uniform line. The steady state a-c solution for the uniform line with no reflections are derived together with the solution of characteristic impedance, propagation constant, phase and group velocities. Solution of the line with reflections is developed in exponential form in terms of the driving and receiving conditions. Standing wave and interference patterns are explored. Introduction to the Crank diagram.

03.385 Transmission Line and Microwave Theory II Prereq. 03.384 2 Cl., 2 Q.H.
Development of the Smith Chart and the circle diagram for the graphical solution of the steady state transmission line. Both lossless and lossy lines will be considered. Reflection coefficient, calculation of current and voltage distribution, characteristic impedance, standing-wave ratio and measurement and impedance matching with single and double stubs will be developed in detail.

03.386 Transmission Line and Microwave Theory III Prereq. 03.385 2 Cl., 2 Q.H.
Review of electrostatics. Introduction to Maxwell's equations. The relation between field and circuit theory. Plane waves in dielectric and conducting media is introduced. The rectangular waveguide equations are derived and some microwave circuits such as magic tee's, hybrids, couplers, and filters are investigated.

Engineering Graphics and Computation

09.307 Electrical and Electronic Graphics I Prereq. None 2 Cl., 2 Q.H.
Instrument techniques; principles of projection, drawing, reading and interpretation of multiview drawings; pictorial, representations.

09.308 Electrical and Electronic Graphics II Prereq. 09.307 2 Cl., 2 Q.H.
Electrical symbols; interconnection diagram; design of block diagrams; characteristics of active and passive electrical components.

09.309 Electrical and Electronic Graphics III Prereq. 09.308 2 Cl., 2 Q.H.
Analysis of simple circuits; printed circuit layouts; packaging of integrated circuits and discrete components; charts and graphs in electrical design.

09.311 Mechanical and Structural Graphics I Prereq. None
1 Cl., 2 Lab., 2 Q.H.
Introduction to engineering drawing, geometric construction, charts and graphs, orthographic projection through auxiliary views.

09.312 Mechanical and Structural Graphics II Prereq. 09.311
1 Cl., 2 Lab., 2 Q.H.
Detail drawing, including intersections and development, reading of multiview drawings, pictorial representation.

09.313 Mechanical and Structural Graphics III Prereq. 09.312
1 Cl., 2 Lab., 2 Q.H.
Commercial hardware; dimensioning; analysis of assemblies; elements of structural, electrical and piping drawing; design project.

09.314 Production Drawings and Design I Prereq. 09.313
1 Cl., 2 Lab., 2 Q.H.
Drawings and specifications for the production and precision machining of castings, forgings, weldments and sheet-metal stampings. Discussion of some common machine components.

09.315 Production Drawings and Design II Prereq. 09.314
1 Cl., 2 Lab., 2 Q.H.
Translatory and rotary motion involving basic mechanisms through graphical and mathematical analysis of displacement, velocity, and acceleration. Simple, compound, reverted and epicyclic gear trains.

09.316 Production Drawings and Design III Prereq. 09.315
1 Cl., 2 Lab., 2 Q.H.
Introduction to design through graphical analysis of cams and follower motions. Creativity and design processes through case studies and original projects requiring oral presentation of student's involvement in both synthesis and innovative activities.

09.351 Principles of Computer Programming I Prereq. 10.320
2 Cl., 2 Q.H.
Elementary methods and techniques of digital computer programming in the Fortran language applied to simple scientific problems.

09.352 Principles of Computer Programming II Prereq. 09.351
2 Cl., 2 Q.H.
Exploration of extended capabilities of the Fortran language and development of the logic and general principles of programming.

09.353 Principles of Computer Programming III Prereq. 09.352
2 Cl., 2 Q.H.
Case studies involving professionally written programs with introductions to associated techniques and mathematics.

Mathematics

10.301 Introduction to Mathematics I Prereq. None 4 Cl., non-credit
A comprehensive review of high school algebra including: first-degree equations, factoring, fractional equations, word problems, and concepts of plane geometry.

10.302 Introduction to Mathematics II Prereq. 10.301 4 Cl., non-credit
Algebraic operations with fractions and mixed expressions, proportions, square roots, radicals, quadratics; simultaneous equations, graphs and fractional exponents. The geometry of the right triangle, areas of polygons, circles, and loci problems. Basic slide rule operation.

10.501 Mathematics I Prereq. Math. Placement Test or 10.302
2 Cl., 2 Q.H.
Methods and applications of algebra; graphical techniques.

10.502 Mathematics II Prereq. 10.501 2 Cl., 2 Q.H.
Methods and applications of algebra continued; exponents and logarithms.

10.503 Mathematics III Prereq. 10.502 2 Cl., 2 Q.H.
Review of geometry; basic trigonometry; introduction to statistics and probability.

10.311 College Algebra I Prereq. Math. Placement Test or 10.302
2 Cl., 2 Q.H.
First part of a rapid but thorough study of algebra — fundamental operations; algebraic fractions; exponents and radicals; functions; linear equations.

10.312 College Algebra II Prereq. 10.311 2 Cl., 2 Q.H.
Quadratic equations and applications; radical equations; complex numbers; binomial expansion; variation; roots of polynomial equations.

10.313 College Trigonometry I Prereq. Math. Placement Test or 10.302
The trigonometric functions of angles both in degree and in radian measure; solution of right angles and applications; trigonometric identities and equations.

10.314 College Trigonometry II Prereq. 10.313 2 Cl., 2 Q.H.
Graphs involving trigonometric functions and other transcendental functions; logarithms and computation; inverse trigonometric functions; applied problems.

10.316 Probability and Statistics I Prereq. 10.503 2 Cl., 2 Q.H.
Basic tools, e.g., sets, permutations and combinations; probability and applications.

10.317 Probability and Statistics II Prereq. 10.316 2 Cl., 2 Q.H.
Descriptive statistics; frequency distributions and probability density functions; normal and other distributions.

10.318 Probability and Statistics III Prereq. 10.317 2 Cl., 2 Q.H.
Bivariate distributions; correlation; statistical inference and estimation; regression.

10.320 Calculus IPrereq. 10.312 and 10.314, or
10.503 4 Cl., 4 Q.H.

Functions, graphs and limits; differentiation and integration of algebraic functions, with applications; study of circles and analysis of the straight line and conic sections.

10.321 Calculus II

Prereq. 10.320 2 Cl., 2 Q.H.

Calculus of non-algebraic functions, trigonometric and inverse trigonometric, logarithmic, exponential, hyperbolic.

10.322 Calculus III

Prereq. 10.321 2 Cl., 2 Q.H.

Differentials; the law of the Mean, and indeterminate forms; techniques of integration; the definite integral and the fundamental theorem, and applications to volume and surface area of revolution and to length of arc of a curve.

10.323 Calculus IV

Prereq. 10.322 2 Cl., 2 Q.H.

Infinite series; partial differentiation; multiple integrals.

10.324 Differential Equations I

Prereq. 10.323 2 Cl., 2 Q.H.

Vector analysis; matrices and linear algebra.

10.325 Differential Equations II

Prereq. 10.324 2 Cl., 2 Q.H.

Ordinary differential equations — standard types of the first order; linear differential equations, especially with constant coefficients. Laplace transforms.

10.326 Differential Equations III

Prereq. 10.325 2 Cl., 2 Q.H.

Series solutions of differential equations; Fourier series and orthogonal functions.

10.351 Advanced Mathematics I (Numerical Analysis)Prereq. 09.353 and 10.326
2 Cl., 2 Q.H.

Basic methods of numerical analysis — roots by iteration; approximating polynomials and interpolation; least squares fitting; numerical integration; approximate solution of ordinary differential equations — problems employing the electronic computer.

10.352 Advanced Mathematics II

Prereq. 10.351 2 Cl., 2 Q.H.

Introduction to partial differential equations, boundary-value problems, Sturm-Liouville systems.

10.353 Advanced Mathematics III

Prereq. 10.352 2 Cl., 2 Q.H.

Special topics in analysis.

10.361 Modern Algebra IPrereq. 10.503 or 10.312 and 10.314
2 Cl., 2 Q.H.

The integers; rational and real numbers; mathematical induction; polynomials.

10.362 Modern Algebra II

Prereq. 10.361 2 Cl., 2 Q.H.

The complex field; equivalence relations; groups; subgroups.

10.363 Modern Algebra III

Prereq. 10.362 2 Cl., 2 Q.H.

Vector spaces; linear independence; linear algebra and transformations.

Physics

*Courses marked * not available in every curriculum. See curricula in Programs of Instruction section, for applicable sequence, pp. 52-93.*

- 11.301 Introductory Physics I** Prereq. None 2 Cl., Non-credit
A survey of physical principles and theories related to field of mechanics. A relatively non-mathematical approach is used.
- 11.302 Introductory Physics II** Prereq. 11.301 2 Cl., Non-credit
Extension of principles in mechanics and introduction of concepts in electricity and magnetism.
- *11.304 General Physics I** Prereq. 10.501 or concurrently
2 Cl., 2 Q.H.
Survey of Newtonian mechanics; kinematics and dynamics of particle motion; projectile and circular motion; rotational motion, conservation laws of energy and momentum.
- *11.305 General Physics II** Prereq. 11.304 2 Cl., 2 Q.H.
Temperature; heat energy; mechanical equivalent of heat; wave motion; sound; Doppler's effect; properties of light; simple optical systems.
- *11.306 General Physics III** Prereq. 11.305 2 Cl., 2 Q.H.
Fundamentals of electricity and magnetism; fields; potential; electric current; inductance; capacitance; electromagnetism; a-c and d-c series circuits.
- *11.311 Physics I (not offered 1968-1969)**
Prereq. 10.311 or concurrently 2 Cl., 2 Q.H.
Kinematics and dynamics of particle motion; Newton's laws; law of gravitation; projectile, circular and relative motions.
- *11.312 Physics II (Offered 1968-1969 only)** Prereq. 11.311
2 Cl., 2 Q.H.
Work; energy; momentum; conservation laws; kinematics and dynamics of rotation; simple harmonic motion.
- *11.313 Physics III (offered 1968-1969 only)** Prereq. 11.312
2 Cl., 2 Q.H.
Electrostatics; magnetism; magnetic induction; induced currents; electrical instruments; direct and alternating current and series circuits.
- *11.314 Physics IV (offered 1968-1969 only)** Prereq. 11.313
2 Cl., 2 Q.H.
Properties of matter; wave motion; intensity; interference phenomena; beats; Doppler effect; vibrating systems.
- *11.315 Physics V (offered 1968-1969 only)** Prereq. 11.313
2 Cl., 2 Q.H.
Temperature; heat; molar heat; change of state; calorimetry; heat transfer; kinetic theory of gases; general gas laws; laws of thermodynamics.

***11.316 Physics VI (offered 1968-1969 only)**Prereq. 11.315
2 Cl., 2 Q.H.

Properties of light; reflection; refraction; dispersion; optical systems; diffraction; interference phenomena; polarization.

11.317 Physics I (Mechanics)Prereq. 10.311 or concurrently
4 Cl., 4 Q.H.

Kinematics and dynamics of particle motion; Newton's laws; projectile and circular motion; conservation laws for momentum and energy; rotational motion; simple harmonic motion.

11.318 Physics II (Wave Motion, Sound, Heat)Prereq. 11.317
4 Cl., 4 Q.H.

Wave motion; intensity; interference phenomena; Doppler effect; vibrating systems; temperature; heat; change of state; heat transfer; kinetic theory of gases; general gas laws; thermodynamics.

11.319 Physics III (Electricity, Magnetism, Light)Prereq. 11.318
4 Cl., 4 Q.H.

Electrostatics; magnetism; magnetic induction; induced currents; direct and alternating current circuits; properties of light; reflection; refraction; dispersion; optical systems; diffraction; polarization.

11.321 Particles and Waves I

Prereq. 11.316 2 Cl., 2 Q.H.

Application of fundamental principles of waves to electromagnetic radiation.

11.322 Particles and Waves II

Prereq. 11.321 2 Cl., 2 Q.H.

Selected topics in antennas and waveguides. Properties of atoms and electrons as related to conduction of electricity in solids.

11.323 Particles and Waves III

Prereq. 11.322 2 Cl., 2 Q.H.

Fundamentals of semiconductors, crystal diodes, and transistors.

11.331 Advanced Physics IPrereq. 11.323 and 10.323
2 Cl., 2 Q.H.

Atomic structure of matter; quantization; Bohr theory of atomic spectra; X-ray; radiation.

11.332 Advanced Physics II

Prereq. 11.331 2 Cl., 2 Q.H.

Introduction to quantum mechanics; de Broglie hypothesis; waves and particles; Pauli exclusion principle and quantum number; spectra.

11.333 Advanced Physics III

Prereq. 11.332 2 Cl., 2 Q.H.

Introduction to theory of relativity; Lorentz transformations; mass and energy; elementary particles; nuclear reactions and transformation of matter and energy.

11.341 Physics Laboratory I

Prereq. 11.316 3 Lab., 2 Q.H.

Experiments covering the fundamental concepts of physics in the fields of mechanics, electricity, and magnetism.

11.342 Physics Laboratory II

Prereq. 11.341 3 Lab., 2 Q.H.

Experiments covering electromagnetic phenomena, heat, and sound.

11.343 Physics Laboratory III

Prereq. 11.342 3 Lab., 2 Q.H.

Experiments covering optics and related topics in the area of modern physics.

Chemistry

12.301 Introductory Chemistry I

Prereq. None 2 Cl., Non-credit

A non-mathematical approach to the concepts of chemistry including matter; elements and compounds, chemical bonding, chemical equations.

12.302 Introductory Chemistry II

Prereq. 12.301 2 Cl., Non-credit

A continuation of 12.301, including Periodic System, forms of energy, oxidation-reduction, solutions, chemical and ionic equilibrium, nuclear reactions, and a brief introduction to organic chemistry.

12.311 General Chemistry I

Prereq. 10.311 or 10.501 or concurrently

2 Cl., 2 Q.H.

Fundamental ideas of matter and energy; properties of gases, liquids and solids; atomic structure; chemical bonding and valence; classification of the elements; acids and bases; solutions of non-electrolytes; solutions of electrolytes; chemical equilibrium.

12.312 General Chemistry II

Prereq. 12.311 2 Cl., 2 Q.H.

Ionic reactions and ionic equilibrium; oxidation-reduction reactions; electro-chemistry; chemical kinetics; colloidal dispersions; nuclear chemistry; chemistry of metals and non-metals; study of families of elements in the Periodic System.

12.313 General Chemistry III

Prereq. 12.312 2 Cl., 2 Q.H.

Chemistry of related and similar metals; coordination compounds; chemistry of organic compounds, both open and closed-chain compounds; organic chemistry of natural and synthetic products, including petroleum, rubber, synthetic resins, plastics, etc.

12.314 General Chemistry and Laboratory I

Prereq. 10.311 or 10.501

or concurrently 2 Cl., 2 Lab., 3 Q.H.

Fundamental ideas of matter and energy. Properties of gases, liquids and solids; atomic structure, chemical bonding and valence; classification of the elements; acids and bases; solutions of non-electrolytes; solutions of electrolytes; chemical equilibrium. Correlated laboratory experiments.

12.315 General Chemistry and Laboratory II

Prereq. 12.314

2 Cl., 2 Lab., 3 Q.H.

Ionic reactions and ionic equilibrium; oxidation-reduction reactions; electro-chemistry; chemical kinetics; colloidal dispersions; nuclear chemistry; chemistry of non-metals and metals; study of families of elements in the Periodic System. Correlated laboratory experiments.

12.316 General Chemistry and Laboratory IIIPrereq. 12.315
2 Cl., 2 Lab., 3 Q.H.

Chemistry of related and similar metals; coordination compounds; chemistry of open and closed chain organic compounds; organic chemistry of natural and synthetic products including petroleum, rubber, synthetic resins, plastics, etc. Correlated laboratory experiments.

12.321 Analytical Chemistry IPrereq. 12.313 or 12.316
2 Cl., 2 Q.H.

Analytical procedure and technique; application of fundamental concepts of solutions to laboratory work; formulation of numerical terms essential to understanding mass action law, ionic equilibria; solubility product, hydrolysis, and redox constants.

12.322 Analytical Chemistry II

Prereq. 12.321 2 Cl., 2 Q.H.

Weighing, measurement of volumes, titration, filtration, ignition, and combustion are considered from standpoint of theoretical principles involved and manipulative technique necessary. Combination of these operations and their application to actual analysis; comprehensive study of volumetric methods and more elementary parts of gravimetric analysis. Problems are introduced to emphasize correct calculation of analytical results as well as procedures.

12.323 Analytical Chemistry III

Prereq. 12.322 2 Cl., 2 Q.H.

Elements of instrumental analysis. Theoretical principles involved in the use of colorimeter, absorption instruments, pH measurements, chromatography, etc.

12.324 Analytical Chemistry Laboratory IPrereq. 12.316 or equivalent
and 12.321 or concurrently 3 Lab., 2 Q.H.

Principles of qualitative chemistry applied to actual problems. Separations and identification of known and unknown solutions. Finally these are combined into a comprehensive system of analysis which is applied to artificially prepared mixtures and industrial materials.

12.325 Analytical Chemistry Laboratory IIPrereq. 12.324
3 Lab., 2 Q.H.

Analytical methods used in quantitative chemistry. Volumetric analysis including acidimetry and alkalimetry, oxidation, reduction, and precipitation methods followed by simple gravimetric analyses.

12.326 Analytical Chemistry Laboratory IIIPrereq. 12.325
3 Lab., 2 Q.H.

Practical applications of instrumental analysis with experience in the use of colorimeter, absorption instruments, pH measurements, chromatography, etc.

12.331 Organic Chemistry I

Prereq. 12.313 or 12.316 2 Cl., 2 Q.H.

Nature of carbon in organic compounds. General principles of structure, nomenclature, preparation, uses, and reactions of aliphatic hydrocarbons: alkanes, alkenes, alkynes, dienes, cycloalkanes. Position and geometric isomerism. Introduction to free radical and ionic mechanisms of reactions.

12.332 Organic Chemistry II

Prereq. 12.331 2 Cl., 2 Q.H.

Structure of benzene, electrophilic aromatic substitution reactions. General principles of structure, nomenclature, preparation, uses and reactions of the various types of organic compounds, including: alcohols, alkyl and aryl halides, ethers and epoxides, and carboxylic acids. Optical isomerism and introductory chemical kinetics will be discussed.

12.333 Organic Chemistry III

Prereq. 12.332 2 Cl., 2 Q.H.

Continuation of Chemistry 12.332 with emphasis on the application of chemical interconversions to synthetic problems. Functional derivatives of carboxylic acids, sulfonic acids and their derivatives, amines, diazonium compounds, phenols, aldehydes and ketones.

12.334 Organic Chemistry Laboratory IPrereq. 12.316 or equivalent
and 12.331 or concurrently 3 Lab., 2 Q.H.

Co-ordinated with the lecture course, Organic Chemistry I, and deals with the preparation and properties of compounds discussed.

12.335 Organic Chemistry Laboratory II

Prereq. 12.334 3 Lab., 2 Q.H.

Co-ordinated with the lecture course, Organic Chemistry II, and deals with the preparation and properties of compounds discussed.

12.336 Organic Chemistry Laboratory III

Prereq. 12.335 3 Lab., 2 Q.H.

Co-ordinated with the lecture course, Organic Chemistry III, and deals with the preparation and properties of compounds discussed.

12.341 Physical Chemistry I

Prereq. 12.313 or 12.316 2 Cl., 2 Q.H.

The three states of matter, atomic and molecular forces, physical properties and molecular structure; heat, work and heat capacity; thermochemistry.

12.342 Physical Chemistry II

Prereq. 12.341 2 Cl., 2 Q.H.

Thermodynamics, solutions, chemical equilibria, phasediagrams, and chemical kinetics.

12.343 Physical Chemistry III

Prereq. 12.342 2 Cl., 2 Q.H.

Electrical conductance, electromotive force, ionic equilibria, colloids, quantum theory, and photochemistry.

12.351 Instrumental and Radiochemistry I

Prereq. 12.323 2 Cl., 2 Q.H.

Definitions, physical principles, scope and application; principles of measurement; endpoint-detection systems for volumetric analysis, data treatment and interpretation. Optical methods of analysis including spectrophotometry, excitation methods, measurements of other optical properties, and mass spectrometry.

12.352 Instrumental and Radiochemistry II

Prereq. 12.351 2 Cl., 2 Q.H.

Methods of separation, vapor phase chromatography, ion exchangers; electrical methods of analysis including potentiometry, voltammetry, coulometry, and conductimetry; miscellaneous instrumental measurements.

12.353 Instrumental and Radiochemistry III

Prereq. 12.352 2 Cl., 2 Q.H.

Radioactivity and nuclear reactions, production and study of nuclear reactions, equations of radioactive decay, nuclear states and radioactive processes, interaction of radiations with matter, radiation detection and measurement, statistics of radioactivity measurements, techniques for the study of radionuclides, tracers in chemical applications and nuclear energy.

12.381 Nuclear Technology I Prereq. 10.323 and 11.316 2 Cl., 2 Q.H.
Atomic and nuclear structure, discovery and nature of radio activity. Nuclear reactions and energy; induced nuclear transformations; neutron properties; applications of radionuclides. Supplementary laboratory experiments.

12.382 Nuclear Technology II Prereq. 12.381 2 Cl., 2 Q.H.
Radiological safety — the hazards, problems, and protection. Nuclear instrumentation for particle detection, monitoring and experimentation. Supplementary laboratory experiments.

12.383 Nuclear Technology III Prereq. 12.382 2 Cl., 2 Q.H.
The fission process and its applications; nuclear reactors — their classification, design and application; nuclear fuel processing; radioactive waste disposal. Supplementary laboratory experiments.

Natural Science

16.531 Oceanography I Prereq. Nat. Sci. Equivalency 2 Q.H.
An introduction to the geology of the ocean basins and the physical and chemical properties of sea water. The development of ocean currents and their effect on the land masses of the world.

16.532 Oceanography II Prereq. 16.531 2 Q.H.
The habitat zones and organisms of the sea. Phytoplankton, zooplankton, and nekton are discussed. The growing economic importance of marine resources for the expanding world population.

16.533 Marine Geology Prereq. Nat. Sci. Equivalency 2 Q.H.
Physiography and structure of ocean basins. Marine geological processes and features, including sedimentation, erosion, shorelines, and bottom topography. Methods and techniques of marine geological exploration.

16.541 Meteorology I Prereq. Nat. Sci. Equivalency 2 Q.H.
Introduction to the structure, composition and phenomena of the atmosphere. Consideration of solar radiation, aurora, airglow, meteors, and radio propagation in the upper atmosphere, followed by a detailed examination of the major weather elements, related measuring instruments and global wind circulation of the troposphere. Laboratory exercises include plotting horizontal and vertical variations in temperature, pressure, and moisture, with analysis of the dynamic interrelationships involved.

16.542 Meteorology II Prereq. 16.541 2 Q.H.
Study of secondary wind circulation, air masses, frontal systems, thunderstorms, hurricanes, and tornadoes. Techniques in local short-range and regional long-range forecasting, with special attention to New England conditions. Laboratory exercises in synoptic weather maps preparation, analysis, and interpretation.

16.543 Climatology Prereq. Nat. Sci. Equivalency 2 Q.H.
 Classification, analysis, and geographic distribution of climatic types. Consideration of microclimates and relationship of weather and climatic elements to other factors in the natural environment and human activities. Opportunity provided to apply effects of these elements to a chosen area of personal interest.

16.551 Astronomy I Prereq. Nat. Sci. Equivalency 2 Q.H.
 Direction, orientation, and division of space and time. The six main types of bodies of the Solar Systems in terms of their observed properties and motions.

16.552 Astronomy II Prereq. 16.551 2 Q.H.
 Light as part of the electromagnetic spectrum and as a fundamental basis of man's observations. A survey of light and radio telescopes, spectroscopes, and other tools of astronomy. The sun as a typical star.

16.553 Astronomy III Prereq. 16.522 2 Q.H.
 Stellar classification, variety, and evolution as fundamentals in the understanding of clusters, galaxies, and cosmology.

Biology

18.304 Integrated Science I Prereq. None 2 Cl., 4 Lab., 4 Q.H.
 Principles of chemistry; principles of biology.

18.305 Integrated Science II Prereq. 18.304 2 Cl., 4 Lab., 4 Q.H.
 Introduction to essential concepts in the major areas of biology; physico-chemical background of biology.

18.306 Integrated Science III Prereq. 18.305 2 Cl., 4 Lab., 4 Q.H.
 Human anatomy and physiology.

18.311 General Biology and Laboratory I 3 Cl., 3 Lab., 4 Q.H.
 Fundamental concepts of the physical, chemical, and biological characteristics and behavior of protoplasm and cells. Plant and animal metabolism.

18.312 General Biology and Laboratory II Prereq. 18.311
 3 Cl., 3 Lab., 4 Q.H.
 Maintenance of internal environment, gametogenesis and cell division, plant life history, invertebrate and vertebrate anatomy.

18.313 General Biology and Laboratory III Prereq. 18.312
 3 Cl., 3 Lab., 4 Q.H.
 Fundamentals of genetics and eugenics; embryology; ecology.

18.314 Botany I Prereq. 18.313 2 Cl., 2 Q.H.
 The plant cell, tissues, and parts of flowering plants.

18.315 Botany II Prereq. 18.314 2 Cl., 2 Q.H.
 Classification of the plant kingdom, plantal life histories.

- 18.316 Botany III** Prereq. 18.315 2 Cl., 2 Q.H.
Physiology and life activities of plants.
- 18.321 Microbiology I** Prereq. 18.313 2 Cl., 4 Lab., 4 Q.H.
Biology of bacteria and other microorganisms, preparation of media, sterilization, staining, isolation, and identification of pure cultures.
- 18.322 Microbiology II** Prereq. 18.321 2 Cl., 4 Lab., 4 Q.H.
Bacteriology of water, sewage, air, and milk. Standards, plate counts, and physiological tests.
- 18.323 Microbiology III** Prereq. 18.322 2 Cl., 4 Lab., 4 Q.H.
Survey of pathogenic microorganisms; metabolic activities.
- 18.324 Human Anatomy and Physiology I** Prereq. 18.306 or 18.313
1 Cl., 3 Lab., 2 Q.H.
The structure and function of vertebrate organ systems.
- 18.325 Human Anatomy and Physiology II** Prereq. 18.324
1 Cl., 3 Lab., 2 Q.H.
Introduction to cellular metabolism.
- 18.326 Human Anatomy and Physiology III** Prereq. 18.325
1 Cl., 3 Lab., 2 Q.H.
Continuation of the study of cellular metabolism.
- 18.329 Seminar In Medical Technology** Prereq. Instructor Permission
2 Cl., 0 Lab., 2 Q.H.
Current topics in Medical Technology. Required readings and presentations by students. Guest lecturers.
- 18.341 Hematology I** Prereq. 18.313 1 Cl., 3 Lab., 2 Q.H.
Basic hematological techniques including discussion of the differential smear and observation of the normal morphology of human red cells, white cells and platelets.
- 18.342 Hematology II** Prereq. 18.341 1 Cl., 3 Lab., 2 Q.H.
Morphologic and etiologic classification of the anemias. Related diagnostic tests will be discussed.
- 18.343 Hematology III** Prereq. 18.342 1 Cl., 3 Lab., 2 Q.H.
Studies of pathologic and physiologic deviations of the white cell series as observed in leukemias and infections. Some animal hematology will be included.
- 18.351 Histology-Organology I** Prereq. 18.313 1 Cl., 2 Lab., 2 Q.H.
The morphology of cells and tissues.
- 18.352 Histology-Organology II** Prereq. 18.351 1 Cl., 2 Lab., 2 Q.H.
The tissue components of the integumentary, digestive, and respiratory systems.

- 18.353 Histology-Organology III** Prereq. 18.352 1 Cl., 2 Lab., 2 Q.H.
The tissue components of the cardiovascular, excretory, reproductive, and endocrine systems.
- 18.357 Genetics I** Prereq. 18.313 2 Cl., 2 Q.H.
Mitosis, meiosis, and mendelian genetics.
- 18.358 Genetics II** Prereq. 18.357 2 Cl., 2 Q.H.
Chromosome mapping, mutations, translocation, chromosomal aberrations.
- 18.359 Genetics III** Prereq. 18.358 2 Cl., 2 Q.H.
Population genetics, aspects of biochemical genetics.
- 18.391 Photomicroscopy** (not offered 1968-1969) 1 Cl., 2 Lab., 2 Q.H.

Pharmacology

- 73.311 Clinical Biochemistry I** Prereq. 12.323, 12.333, 18.323
1 Cl., 3 Lab., 2 Q.H.
Enzymes and hormones of clinical and pathologic interest with experiments to interpret disordered biochemistry.
- 73.312 Clinical Biochemistry II** Prereq. 73.311
1 Cl., 3 Lab., 2 Q.H.
Pathogenesis of renal tubular dysjunction, intestinal malabsorption syndromes, hormone assay and significance, and endocrine functions.
- 73.313 Clinical Biochemistry III** Prereq. 73.312
1 Cl., 3 Lab., 2 Q.H.
Abnormality of electrolyte metabolism, lipid transport and mobilization histochemical technics, vitamin abnormalities, clinical aspects of biochemical genetics and radioisotopic applications.

Liberal Arts

Students wishing to elect other Humanities, Social Science, and Natural Science courses should refer to the University College Catalog and petition for approval by the Committee on Education of Lincoln College.

- 19.501, 19.502, 19.503 Psychology I, II, III** 6 Q.H.
An introductory survey of the general field of psychology. The first term covers historical backgrounds of psychology, psychological measurement and testing, personality, behavior disorders, and psychotherapy. The second term includes maturation and development, principles of animal and human learning, memory, thought, motivation, and emotion. The third term covers sensory processes, perception, social psychology, and psychology in industry.
- 21.501, 21.502, 21.503 Sociology I, II, III** Prereq. 30.506 6 Q.H.
Basic concepts and theories relating to the study of man as a participant in group life with emphasis on social structure, socialization, social stratification, collective behavior, population, and the major institutional areas.

23.501 Western Civilization I

2 Q.H.

The beginnings of Western civilization with emphasis on the political, economic, and social history of the ancient and medieval world.

23.502 Western Civilization II

2 Q.H.

Modern Europe to 1815 with an examination of the two major intellectual movements — the Renaissance and the Enlightenment — and their impact upon religious movements, economic developments, and the rise of national states.

23.503 Western Civilization III

2 Q.H.

Western civilization since 1815, emphasizing the Scientific and Industrial Revolutions and their impact upon democracy and authoritarianism, nationalism and internationalism, and war and peace.

30.504, 30.505, 30.506 English I, II, III

6 Q.H.

Review of grammar and punctuation through drill. A study of the techniques of exposition, description, argumentation, narration, and documentation; frequent theme assignments to develop skill in writing; related readings.

Students enrolling in English (30.504) will be given a diagnostic test during the first meeting of class. The purpose of this test is to determine whether the student's level of preparation in English is sufficient to enable him to do the work required in the course. If his score indicates that he falls below the minimum level required, he will be given information about obtaining additional preparation from the Center for Programmed Study, which is located in the Dodge Library.

30.507, 30.508, 30.509 Introduction to Literature I, II, III

Prereq. 30.506 6 Q.H.

Prose fiction, plays, and poems. Writing of critical papers.

Business Management

Students wishing to elect other business courses should refer to the University College catalogue and petition for approval by the Committee on Education of Lincoln College.

39.501, 39.502, 39.503 Economic Principles and Problems I, II, III

6 Q.H.

Introduction to economic theory and problems. Business cycles, money and banking system, fiscal policy, economic growth, fluctuations in national income as well as the economic problems of monopoly, industrial relations, international economic problems and competing economic systems. Emphasis is placed on basic principles and laws and consideration is given to current economic problems.

39.510 Statistics for Quality Control

Prereq. 10.503 or equiv. 2 Q.H.

Fundamentals of statistical concepts and computations necessary to the understanding of statistical quality control. Frequency distributions, measures of centering and dispersion; computation of average and standard deviation for ungrouped and grouped data; determination of areas under the normal distribution curve; standard deviation of the mean. Combinations and permutations and their use of compute probabilities computations associated with the hypergeometric, binomial and Poisson distributions.

39.511, 39.512, 39.513 Statistics I, II, III Prereq. 39.503 6 Q.H.

Statistical techniques and their application; descriptive measures of shape, location and dispersion; an introduction to probability; sampling and simple analysis of observed distributions; advanced concepts in probability; sampling and statistical inference; time series analysis; correlation and index numbers.

41.501, 41.502, 41.503 Accounting Principles I, II, III 6 Q.H.

A basic course in accounting designed to familiarize students with the fundamental accounting principles with a background to business through accounting. Emphasis is placed on understanding the basic accounting process and the analytical and interpretive aspects of accounting as a managerial tool.

45.501, 45.502, 45.503 Management and Organization I, II, III 6 Q.H.

Fundamental concepts of management and organization are first developed. These concepts are then applied to the management and organizations of the basic business functions: marketing, production, personnel and finance.

45.510 Labor Management Relations Prereq. 39.503 2 Q.H.

History of the labor movement and American industrial relations developments, law and institutions; theory of collective bargaining and the practice of management and of unions; bargaining negotiations, strikes and public policy in industrial relations and wage bargaining; employment problems, economic growth and structure change.

45.541 Law I—Contracts Prereq. None 2 Q.H.

Contracts: nature, kinds and formation of contracts; essential elements; form and interpretation of contracts; breach, remedies and damages.

45.542 Law II—Agency and Sales Prereq. 45.541 2 Q.H.

Agency: nature, purpose and formation of agency relationships; rights and duties of principal and agent, scope of agent's authority; rights and duties of principal and third persons; termination of agency.

Sales: nature of sales contracts; warranties; transfer of title; rights and remedies of seller and buyer.

45.543 Law III Prereq. 45.542 2 Q.H.

NEGOTIABLE INSTRUMENTS: Bills, notes, and checks; requirements of a negotiable instrument; liabilities and defenses of parties; procedure upon dishonor; discharge.

PARTNERSHIPS: Nature, kinds, and formation; rights and duties of partners; partner's authority to bind firm; relation of partners and third persons; dissolution and winding up.

45.561 Statistical Quality Control I Prereq. 39.513 or 39.510 2 Q.H.

Description and practical application of the basic statistical quality control methods for quality assurance, quality control and quality improvement of products and services: the tools for reducing and controlling the costs of scrap, rework, repair, customer complaints and warranty.

The determination of process capability; use of histograms to identify abnormal variability; the use of quality control charts for measurable and non-measurable quality characteristics, including Shewhart, Multi-Vari, median, percent defective and defects per unit; corrective action techniques; complying to government quality control system requirements; psychological factors in controlling quality.

45.563 Management of Quality Control

2 Q.H.

Modern concepts of managing the quality function of a company to maximize customer satisfaction at minimum quality cost. The idea of Total Quality Control; measurement of the costs of quality; use of Pareto's Rule to identify the major unsolved quality problems, development of a coordinated program of improvement, organizing for diagnosing the defect causes. The Quality Control system; improvement and control of vendor quality; in process control; outgoing product control; customer quality relations. Organizing of the quality function.

45.570, 45.571, 45.572 Electronic Data Processing I, II, III

6 Q.H.

The first two quarters are planned to acquaint the executive, accountant, and the methods and systems analyst with automatic electronic equipment and its potential applications. This includes a comprehensive survey of the machine components of such systems, their characteristics, and assembly to handle various business accounting problems; comparison of speed, capacity, flexibility, reliability and cost; discussion of input and output devices, memory (storage), arithmetic and control elements; elementary programming, number systems; integrated data processing in businesses, such as retail sales, inventory, payroll, and banking accounting. The third quarter is spent in the study of the use of EDP as a tool of management.

This study includes the use of EDP in areas such as forecasting, inventory, production scheduling and distribution. The basic principles of operations research and their application to business problems; the use of PERT as a scheduling and control technique. Hybrid centralized/decentralized management through computer time-sharing. Other trends.

Health Care Administration

86.501 Medical Terminology

2 Q.H.

A study of the terminology utilized in the patient care setting for students without medical or nursing backgrounds. Stems; prefixes; suffixes commonly encountered in hospital and other patient-care activities.

86.502 Hospital Law and Ethics

2 Q.H.

A study of important legal principles and rulings of importance to medical records administrators; hospital administrative personnel; nurses; and others. Brief introduction to interpersonal ethics in the health-care setting.

86.504, 86.505, 86.506 Foundations of Medical Science I, II, III

6 Q.H.

Study, primarily through physicians' lectures, of the major disease problems in our society, with an overview of modes of treatment. This course is intended to provide the student with a non-medical background with some appreciation of the problems faced by the physician in his daily practice, in order to facilitate communication between medical and non-medical members of the health-care team.



The Lincoln College Faculty

THE STRENGTH of an educational institution lies in the quality of its faculty. This is especially true in a college devoted to the training of mature men and women, many of whom are already employed in their chosen professions.

The instructional staff of Lincoln College is composed of professional academicians from Northeastern University and neighboring educational institutions and practicing professionals from the scientific and industrial community of Greater Boston. The theoretical training and practical experience represented by this combination of specialists is ideally suited to the technology programs they teach and the adult students they serve.

The faculty are selected for their ability and active interest in the welfare of ambitious part-time students. They are men and women of culture and high ideas and are qualified by educational training and professional experience to teach effectively in their respective fields.

A staff of experienced professional educators who serve as program and course consultants, constitutes the Academic Advisory Council and Curriculum Advisory Committee of the College. They guide, supervise and assist with the administration of courses and programs.

The Faculty

(As of March 1, 1968)

The following is an alphabetical list of the faculty of Lincoln College. Year of appointment, colleges and universities attended, degrees earned, professional affiliation and titles and Lincoln College department are listed.

Arnold W. Almquist, Jr. Appointed 1967
B.S. Bridgewater State, 1955; M.Ed. Bridgewater State, 1959; Instructor,
Needham High School.
Mathematics

George H. Anderson Appointed 1956
Commercial Art Diploma, Vesper George School of Art, 1948; Professional
Artist; Free Lance Technical Illustrator.
Engineering Graphics and Computation

Paul A. Andrews Appointed 1959
B.A. Boston University, 1951; M.S. Northeastern University, 1957; Scientist,
Polaroid Corporation.
Chemistry

Robert B. Angus, Jr. Appointed 1948
B.S. Northeastern University, 1947; M.S. Harvard University, 1953; P.E.
(Mass.); Senior Engineering Specialist in the Communications Systems Labo-
ratory, Sylvania Electric Products, Inc.
Electrical Engineering Technology

Roger M. Antoine Appointed 1955
Baccalaureate, Marseille University, 1942; Licence es-Science, Marseille Uni-
versity, 1945; Diploma of Meteorology, Marseille University, 1946; Diploma
of Engineering, Marseille School of Engineering, 1946; Associate Professor
of Mathematics, Northeastern University.
Course Consultant for Mathematics

Louis E. Ashley Appointed 1966
A.B. Boston University, 1952; Assistant Section Chief, Avco Corporation
Space Systems Division.
Mechanical Engineering Technology

Robert J. Averill Appointed 1957
B.S. Northeastern University, 1957; M.S. Northeastern University, 1959;
Cambridge Electron Accelerator, Harvard University.
Course Consultant for Electrical Engineering Technology

Warren F. Averill Appointed 1967
B.S. Boston University, 1958; M.S. Simmons College, 1966; Research Chem-
ist, Ionics, Inc.; Master, Noble & Greenough School.
Chemistry

Russell H. Babcock

Appointed 1954

S.B. Tufts College, 1945; S.M. Harvard University, 1947; Diplomate, American Academy of Environmental Engineers; P.E. (Mass., Maine, N.H., R.I., Vermont); Manager, Environmental Resources Division, The Foxboro Company.
Civil Engineering Technology

John C. Balsavich

Appointed 1957

Massachusetts Radio School, 1956; Laboratory Supervisor, Electrical Engineering Department, Northeastern University.
Electrical Engineering Technology

Joseph E. Barbeau

Appointed 1966

B.S. Northeastern University, 1955; M.Ed. Northeastern University, 1966; Associate Professor, Department Cooperative Education, Northeastern University.
Chemistry

Robert T. Bateman

Appointed 1957

B.S. University of New Hampshire, 1937; M.A. University of Maine, 1950; Head of Mathematics Department, Wellesley Senior High School.
Course Consultant for Mathematics

G. Warren Bates

Appointed 1949

B.S. Massachusetts Institute of Technology, 1926; M.A. Boston University, 1937; Instructor, Medford High School.
Mathematics

Adolph Baumann

Appointed 1955

B.S. Kantonales Technikum, Winterthur, Switzerland, 1940; Graduate Studies, Massachusetts Institute of Technology, 1952-1956; Technical Staff, Radio Corporation of America.
Electrical Engineering Technology

Matteo P. Berardi

Appointed 1960

B.S. Northeastern University, 1960; M.S. Northeastern University, 1962; Scientist, Avco Corporation Space Systems Division.
Mechanical Engineering Technology

Paul J. Berger

Appointed 1967

S.B. Massachusetts Institute of Technology, 1963; A.M. Harvard University, 1965; Research Associate, Harvard University.
Physics

Narpat Bhandari

Appointed 1967

B.S. Birla Engineering College, 1961; M.S. Purdue University, 1963; Senior Engineer, Sylvania Electric Products, Inc.
Electrical Engineering Technology

- Alfred L. Birch** Appointed 1965
B.S.E.E. University of Connecticut, 1952; P.E. (Mass.); Department Head, Development Engineering, Western Electric Company.
Electrical Engineering Technology
- Ralph S. Blanchard, Jr.** Appointed 1967
B.S. University of New Hampshire, 1950; M.S. Northeastern University, 1954; P.E. (Mass.); Associate Professor Mechanical Engineering, Northeastern University.
Mechanical Engineering Technology
- Emmanuel E. Bliamptis** Appointed 1965
B.S. University of Rhode Island, 1955; S.M. Massachusetts Institute of Technology, 1958; M.A. Boston University, 1966; P.E. (Mass.); Research Physicist, Air Force Cambridge Research Laboratories.
Physics
- Joseph I. Bluhm** Appointed 1966
S.B. Massachusetts Institute of Technology, 1941; M.S. Massachusetts Institute of Technology, 1953; P.E. (Mass., Ohio); Chief, Applied Mechanics Research Laboratory, U.S. Army Materials Research Agency.
Mechanical Engineering Technology
- Sidney Bluhm** Appointed 1965
A.B. Harvard College, 1932; Ed.M. Boston Teachers College, 1933; A.M. Boston University, 1951; Head of Science Department, Boston Technical High School.
Physics
- Edward Bobroff** Appointed 1946
B.M.E. Polytechnic Institute of Brooklyn, N.Y., 1940; P.E. (Mass.); Chief Engineer, Combat Systems, Boston Naval Shipyard.
Mathematics
- Fletcher S. Boig** Appointed 1945
B.S. Tufts College, 1932; M.S. Massachusetts Institute of Technology, 1933; Ed.M. Tufts College, 1937; Associate Professor of Chemistry, Northeastern University.
Program Consultant for Chemistry
- Edward J. Booth** Appointed 1956
A.B. Boston College, 1933; Ed.M. Boston College Graduate School, 1937; Associate Professor of Mathematics, Northeastern University.
Mathematics
- Kenneth E. Bourque** Appointed 1959
B.S. Northeastern University, 1958; M.S. Northeastern University, 1960; Senior Engineer, Edgerton, Germeshausen & Grier.
Electrical Engineering Technology
- H. Bowden** Appointed 1967
B.S. Salem State; Teacher, Lynn School System.
Mathematics

- Robert B. Brack** Appointed 1966
B.S.C.E. University of Massachusetts, 1960; M.Ed. Northeastern University, 1965; Instructor, Wentworth Institute; Sales Engineer, Barker Steel Co., Inc.
Civil Engineering Technology
- Eugene G. Branca** Appointed 1946
S.B. Massachusetts Institute of Technology, 1931; S.M. Massachusetts Institute of Technology, 1932; Assistant Headmaster, Hyde Park High School.
Mathematics
- Donald H. Breslow** Appointed 1959
S.B. Brown University, 1954; M.S. Brown University, 1957; Staff Electrical Engineer, Itek Corporation.
Electrical Engineering Technology
- Alfred E. Bresnahan** Appointed 1967
B.S. Boston College, 1951; Chairman Mathematics Department, Lynn English High School.
Mathematics
- Karl L. Briggs** Appointed 1957
B.S. Norwich University, 1924; M.A. Suffolk University, 1955; Former Head of Mathematics Department, Quincy High School.
Mathematics
- Donald C. Brock** Appointed 1965
B.S. Bridgewater State College, 1959; M.S. Boston University, 1965; Mathematics Instructor, Needham High School.
Mathematics
- Bruno Brodfeld** Appointed 1965
B.S.C.E. Institute of Civil Engineering, Bucharest, Rumania, 1951; P.E. (Mass.); Hydraulic Engineer, Stone & Webster Engineering Corporation.
Civil Engineering Technology
- Curtis C. Brooks** Appointed 1937
B.M.E. Northeastern University, 1924; A.M. Boston University, 1937; Retired.
Mathematics and Mechanical Engineering Technology
- Franklyn K. Brown** Appointed 1955
Lowell Institute, 1939; B.S.Ed. Northeastern University, 1959; M.Ed. Northeastern University, 1963; Associate Professor, Graphic Science, Northeastern University.
Course Consultant for Production Drawing and Design
- Ralph C. Browne** Appointed 1967
B.S.C.E. Northeastern University, 1955; P.E. (Mass.); Systems Engineer, General Electric Company.
Mechanical Engineering Technology

William O. Bruehl Appointed 1956
 B.S. University of Maryland, 1928; Major, U.S. Army, Honorary Retired; Ordnance Engineer, United States Army Ordnance Corps; Assistant Professor, Mechanical Engineering, Northeastern University.
Course Consultant for Mechanical Engineering Technology

Ralph A. Buonopane Appointed 1964
 B.S.Ch.E. Northeastern University, 1961; M.S.Ch.E. Northeastern University, 1963; Ph.D. Northeastern University, 1967; Assistant Professor of Chemical Engineering, Northeastern University.
Chemistry

Morris H. Burakoff Appointed 1957
 B.S. University of Massachusetts, 1940; P.E. (Mass.); Department Chief, Western Electric Company.
Electrical Engineering Technology

George E. Burdick Appointed 1950
 A.B. Boston University, 1949; P.E. (Mass.); Consulting Engineer, Burdick Engineering Company.
Electrical Engineering Technology

Donald Burgess Appointed 1967
 A.B. Boston College, 1953; M.Ed. Boston State College, 1956; Master, Boston Technical High School.
Mathematics

Frederick J. Bush Appointed 1966
 M.E. Stevens Institute of Technology, 1945; M.S. Stevens Institute of Technology, 1951; Senior Project Engineer, Polaroid Corporation.
Mathematics

Steven Butcher, Jr. Appointed 1967
 S.B. Brown University, 1950; M.S. Northeastern University, 1959; Technical Staff, The Mitre Corporation.
Electrical Engineering Technology

Paul F. Butler Appointed 1967
 B.S. Salem State College, 1955; M.S. Central Connecticut State College, 1962; M.S. Clarkson College of Technology, 1965; Mathematics Teacher, Needham Public Schools.
Mathematics

William D. Byard Appointed 1966
 B.S. Suffolk University, 1954; M.S. Suffolk University, 1957; Graduate Study, Brandeis University, 1961; Experimental Biologist, Commonwealth of Massachusetts.
Medical Technology

James A. Caffrey

Appointed 1952

Ph.B. Boston College, 1922; M.Ed. Boston College, 1926; Instructor in Mathematics, Newman Preparatory School.

Mathematics

Leroy M. Cahoon

Appointed 1962

B.S. in C.E. Thayer School Dartmouth College, 1947; M.S. Northeastern University, 1956; P.E. (Mass.); Associate Professor of Civil Engineering, Northeastern University.

Program Consultant for Civil Engineering Technology

Richard A. Caldwell

Appointed 1967

B.S. Boston University, 1960; Ed.M. Boston University, 1963; M.S. Simmons College, 1967; Science Teacher, Hingham High School.

Physics

Robert E. Cameron

Appointed 1956

B.S. Northeastern University, 1951; Graduate Study, Purdue University, 1964-66; P.E. (Mass., N.H.); R.L.S. (Mass.); Owner and Manager, R. E. Cameron, Civil Engineer.

Civil Engineering Technology

Frank R. Cangiano

Appointed 1957

B.S. Boston University, 1957; Ed.M. Northeastern University, 1965; Instructor in Science and Mathematics, Medford High School.

Mathematics

Michael A. Cangiano

Appointed 1946

S.B. Harvard University, 1933; Ed.M. Tufts College, 1949; Senior Sub-master, Medford High School.

Mathematics

Alfred F. Carpenito

Appointed 1965

B.S. Boston State College, 1953; A.M. Suffolk University, 1955; Ed.M. Northeastern University, 1965; Head of Department — Drafting, Boston, Technical High School.

Engineering Graphics and Computation

Richard I. Carter

Appointed 1955

B.S. Northeastern University, 1952; M.S. Northeastern University, 1956; P.E. (Mass.); Associate Professor in Electrical Engineering and Director Computation Center, Northeastern University.

Engineering Graphics and Computation

Walter J. Casey

Appointed 1955

A.B. Boston College, 1951; M.Ed. Boston Teachers College, 1952; M.A.T. Brown University, 1964; Teacher, Boston Latin School.

Mathematics

John H. Cashman

Appointed 1966

B.S. Northeastern University, 1961; M.S. University of Detroit, 1963.

Mechanical Engineering Technology

Walter J. Charow Appointed 1955
B.S.E.E. Worcester Polytechnic Institute, 1949; M.S.E.E. Worcester Polytechnic Institute, 1950; P.E. (Mass.); Technical Staff, The Mitre Corporation.
Electrical Engineering Technology

Bruce B. Claflin Appointed 1964
A.B. Harvard University, 1953; M.S. Northeastern University, 1958; Assistant Professor of Mathematics, Northeastern University.
Course Consultant for Mathematics

Philip J. Clang Appointed 1957
B.S. University of Connecticut, 1950; P.E. (Mass.); Principal Engineer, Jackson & Moreland, Division of United Engineers and Constructors Inc.
Mechanical Engineering Technology

Laurence F. Cleveland Appointed 1931
B.S. Worcester Polytechnic Institute, 1929; M.S. Massachusetts Institute of Technology, 1935; P.E. (Mass.); Professor of Electrical Engineering, Northeastern University.
Program Consultant for Electrical Engineering Technology

Thomas C. Coleman Appointed 1960
B.S.M.E. Tufts University, 1959; M.S.M.E. Northeastern University, 1961; Assistant Professor in Mechanical Engineering, Northeastern University.
Course Consultant for Mechanical Engineering Technology

Francis R. Collins Appointed 1963
B.S. Northeastern University, 1961; M.S. Northeastern University, 1963; Technical Staff, Advanced Planning for Communications, The Mitre Corporation.
Electrical Engineering Technology

Leonard M. Conlin Appointed 1967
A.B. Niagara University, 1952; Ed.M. Worcester State College, 1958; Mathematics Teacher, Framingham North High School.
Mathematics

Charles W. Connolly Appointed 1967
B.S. Boston College, 1947; M.Ed. Boston University, 1953; M.A. Worcester Polytechnic Institute, 1964; Director Science Department, Lynn Classical High School.
Physics

Joseph V. Connolly Appointed 1965
B.S. Boston College, 1952; M.Ed. State College at Boston, 1956; Master in Charge, Roosevelt Annex, Boston English High School.
Physics

- Jerome J. Conner, Jr.** Appointed 1957
S.B. Massachusetts Institute of Technology, 1953; S.M. Massachusetts Institute of Technology, 1954; Sc.D. Massachusetts Institute of Technology, 1959; Associate Professor of Civil Engineering, Massachusetts Institute of Technology.
Mechanical Engineering Technology
- Roger T. Connor** Appointed 1953
A.B. Boston College, 1952; M.Ed. State Teachers College, Boston, 1953; Head of Mathematics Department, Boston Technical High School.
Mathematics
- Robert J. Connors** Appointed 1947
B.S. Northeastern University, 1948; Manager of Technology, Electronic Systems, Sylvania Electric Products, Inc.
Electrical Engineering Technology
- Edward M. Cook** Appointed 1941
A.B. Harvard College, 1935; A.M. Boston University, 1947; Professor of Mathematics, Northeastern University.
Program Consultant for Mathematics
- Maureen P. Cooney** Appointed 1965
S.B. Boston College, 1962; Instructor of Mathematics, Quincy High School.
Mathematics
- Joseph Z. Cooper** Appointed 1967
B.S.E. Johns Hopkins University, 1962; Senior Systems Analyst, Raytheon Company.
Engineering Graphics and Computation
- Richard E. Cox** Appointed 1967
B.S.M.E. Tufts University, 1962; P.E. (Mass.); Senior Engineer, Dynamics Research Corporation.
Mechanical Engineering Technology
- Thomas J. Crowley** Appointed 1966
S.B. Northeastern University, 1958; M.S. Northeastern University, 1962; Research Associate, Harvard University School of Public Health.
Mechanical Engineering Technology
- Dominic J. Cucinotti** Appointed 1966
B.S. Northeastern University, 1955; M.S. Northeastern University, 1965; Engineer, Stone & Webster Engineering Corporation.
Engineering Graphics and Computation
- Herbert R. Davenport** Appointed 1948
B.S. Northeastern University, 1937; Quality Control Engineer, General Radio Co.
Electrical Engineering Technology

- Warren C. Dean** Appointed 1941
A.B. Boston University, 1931; M.A. Boston University, 1940; Associate Professor of Mathematics, Northeastern University.
Mathematics
- Dean DeMarre** Appointed 1967
A.E. Lincoln College, 1963; B.S. Northeastern University, 1966; Bioelectronic Engineer, Brandeis University.
Electrical Engineering Technology
- Thomas R. Deveney** Appointed 1965
B.S. Boston College, 1961; Instructor in Mathematics, Boston Latin School.
Mathematics
- Peter C. DiCarlo** Appointed 1963
B.S.M.E. Northeastern University, 1961; M.S.M.E. Northeastern University, 1963; Senior Aeronautical Engineer, Itek Corporation.
Mechanical Engineering Technology
- Giles C. Dilg** Appointed 1966
B.S.E.E. Syracuse University, 1958; M.S.E.E. Northeastern University, 1964; Senior Research Engineer, Avco Everett Research Laboratory.
Engineering Graphics and Computation
- Francis J. DiSabatino** Appointed 1965
B.S. Tufts University, 1949; Ed.M. Tufts University, 1950; Coordinator of Science, Norwell School Department.
Chemistry
- Roland E. DuBois** Appointed 1967
B.S. University of Maine, 1961; M.S. Northeastern University, 1962; Development Engineer, Western Electric Company.
Engineering Graphics and Computation
- William V. Durante** Appointed 1964
B.S. Boston College, 1951; M.Ed. Boston State College, 1952; M.A. Boston College, 1967; Head of Mathematics Department, Boston Latin High School.
Mathematics
- Jon A. Ebacher** Appointed 1967
B.S. Northeastern University, 1966; Teaching Assistant, Northeastern University.
Mechanical Engineering Technology
- Donald H. Eckhardt** Appointed 1967
B.S. Massachusetts Institute of Technology, 1955; Ph.D. Massachusetts Institute of Technology, 1961; Research Physicist, Air Force Cambridge Research Laboratories.
Mathematics

- Henry B. Eden** Appointed 1957
 School of the Museum of Fine Arts, 1951; Art Director, Vice President, Anco Technical Services, Inc.
Engineering Graphics and Computation
- Herbert E. Engel** Appointed 1958
 B.S. College of the City of New York, 1949; M.S. Northeastern University, 1961; Project Engineer, Dynamics Research Corporation.
Electrical Engineering Technology
- Charles P. Engelhardt, Jr.** Appointed 1942
 B.S. Harvard University, 1928; Master of Architecture, Harvard University, 1930; Architect, U.S. Post Office Department Regional Engineers.
Engineering Graphics and Computation
- Adolf J. Erikson** Appointed 1966
 B.B.A. Northeastern University, 1950; M.B.A. Northeastern University, 1966; P.E. (Mass.); Leader, Engineering, R.C.A. Memory Prod. Oper.
Engineering Graphics and Computation
- George A. Fargo** Appointed 1967
 B.S. State College at Worcester, 1960; M.S. State College at Worcester, 1963; Mathematics Teacher, Framingham North High School.
Mathematics
- John T. Farrington** Appointed 1966
 B.S. Rhode Island College, 1962; Ed.M. Northeastern University, 1966; Asst. Supt. of Schools, Easton, Mass.
Engineering Graphics and Computation
- Martin J. Feeney** Appointed 1957
 S.B. Massachusetts Institute of Technology, 1931; Ed.M. Boston State College, 1938; Principal, Henry Grew District, Boston Public Schools.
Mathematics
- Warren G. Ferzoco** Appointed 1966
 A.E. Lincoln Institute, 1960; B.B.A. Northeastern University, 1963; M.Ed. State College at Boston, 1966; Instructor, Rindge Technical High School.
Engineering Graphics and Computation
- Kevin J. Field** Appointed 1967
 B.S.M.E. Northeastern University, 1967; Graduate Student, Northeastern University.
Mechanical Engineering Technology
- William D. Finan** Appointed 1946
 A.B. Boston College, 1938; M.A. Columbia University, 1941; Reading Consultant, Division of Pupil Personnel Services, Newton Public Schools.
Mathematics

Louis A. Fiore Appointed 1956
A.E. Lincoln Technical Institute, 1944; B.B.A. Northeastern University, 1946;
Mechanical Engineer, Design Checker, American Science and Engineering, Inc.
Engineering Graphics and Computation

Brian P. Fitzgerald Appointed 1966
B.E.E. Manhattan College, 1957; M.S.E.E. Northeastern University, 1965;
Advanced Research Engineer, Applied Research Laboratory, Sylvania Electric
Products, Inc.
Electrical Engineering Technology

Thomas M. Fitzgerald Appointed 1967
Sc.B. Boston College, 1958; Sc.M. Brown University, 1961; Ph.D. Brown
University, 1963; Staff Member, NASA Electronic Research Center.
Physics

Robert F. Ford Appointed 1962
B.S.E.E. Northeastern University, 1961; M.S.E.E. Northeastern University,
1963; Senior Sales Engineer, Fairfield Instrumentation.
Electrical Engineering Technology

Eugene G. Fortin Appointed 1958
B.A. St. Anselm's College, 1954; Engineer, Radio Corporation of America.
Chemistry

Earlwood T. Fortini Appointed 1957
Lowell Institute School, 1947; A.B. Harvard University, 1963; P.E. (Mass.);
Staff Engineer, Compugraphic Corporation.
Mechanical Engineering Technology

John L. Freedman Appointed 1949
S.B. Massachusetts Institute of Technology, 1932; P.E. (Mass.); Senior
Project Engineer, American Science & Engineering, Inc.
Course Consultant for Electrical Engineering Technology

Jordan H. Freedman Appointed 1967
B.S. Northeastern University, 1963; M.S. Northeastern University, 1966;
Member Technical Staff, Radio Corporation of America.
Electrical Engineering Technology

Jerry M. Galatis Appointed 1965
B.S. Northeastern University, 1948; M.Ed. Northeastern University, 1962;
Nuclear Research, Controls for Radiation.
Physics

Donald V. Gearan Appointed 1965
B.S. Fitchburg State College, 1952; M.Ed. Fitchburg State College, 1959;
Teacher of Engineering Drawing, Weston High School.
Engineering Graphics and Computation

Joseph P. Gentile

Appointed 1967

B.S. Massachusetts College of Pharmacy, 1966; M.S. Northeastern University, 1967. R.Ph. Commonwealth of Massachusetts; Doctoral Candidate Department of Biology, Boston College.

Biology

Peter D. Gianino

Appointed 1965

B.S. Boston College, 1953; M.S. Northeastern University, 1959; Research Physicist, Air Force Cambridge Research Laboratories.

Physics

Charles J. Glassbrenner

Appointed 1967

B.S. Siena College, 1950; M.S. Siena College, 1956; Ph.D. University of Connecticut, 1963; Associate Professor, Worcester State College.

Physics

William B. Goggins, Jr.

Appointed 1965

B.S. U.S. Naval Academy, 1957; M.S.E.E. Air Force Institute of Technology, 1962; P.E. (Ohio); Research Engineer, Air Force Cambridge Research Laboratories.

Electrical Engineering Technology

Norman Gordon

Appointed 1967

B.A. Harvard University, 1956; M.Ed. Boston State College, 1957; C.A.G.S. in Physics, Boston College, 1963; Physics Teacher, Boston Latin School.

Physics

Santo J. Gozzo

Appointed 1967

S.B. Massachusetts Institute of Technology, 1955; P.E. (Mass.); Sanitary Engineer, Federal Water Pollution Control Administration; Private Practice.

Mechanical Engineering Technology

Domenic N. Gualtieri

Appointed 1967

B.S. University of Massachusetts, 1960; Ed.M. State College at Salem, 1964; Mathematics Editor, Allyn and Bacon Inc.

Mathematics

Arthur F. Gustus

Appointed 1963

B.S. Boston State College, 1953; M.Ed. Boston State College, 1956; Certificate Postgraduate Study Boston College, 1964; Supervisor of Science, Boston Public Schools.

Physics

Joseph L. Hallett, Jr.

Appointed 1958

S.B. Northeastern University, 1955; Section Head, Sylvania Electric Products, Inc.

Electrical Engineering Technology

Frank A. Hamilton

Appointed 1947

A.E. Lincoln Technical Institute, 1939; Structural Engineer, Jackson & Moreland Division of United Engineers & Constructors, Inc.

Civil Engineering Technology

- Alden G. Handy** Appointed 1957
B.S. Boston University, 1924; M.A. Boston University, 1936; Consultant,
Optics.
Physics
- Francis R. Hankard** Appointed 1946
S.B. Northeastern University, 1946; M.A. Boston University, 1949; Chemist,
State Police Laboratories.
Course Consultant for Physics
- George C. Harrison** Appointed 1963
B.S. Northeastern University, 1961; M.S. Northeastern University, 1963;
Electronic Circuits Senior Design Engineer, Radio Corporation of America.
Electrical Engineering Technology
- Joseph I. Herzlinger** Appointed 1967
B.S. Newark College of Engineering, 1940; M.S. Drexel Institute of Technol-
ogy, 1961; P.E. (New Jersey); Leader Technical Staff, Aerospace Systems
Division, Radio Corporation of America.
Mechanical Engineering Technology
- Harry E. Hewes** Appointed 1967
B.S.B.A. Boston College, 1952; M.Ed. Calvin Coolidge College, 1958; Teacher,
Boston Latin School.
Mathematics
- Lewis H. Holzman** Appointed 1966
B.S.C.E. Lehigh University, 1951; S.M.C.E. Massachusetts Institute of Tech-
nology, 1958; P.E. (Mass); Vice President, Computer Dynamics, Inc.
Engineering Graphics and Computation
- Janet M. Hoopes** Appointed 1967
B.S. Medical Technology University of Delaware, 1965; Medical Technologist,
New England Baptist Hospital.
Medical Technology
- Arthur F. Howe** Appointed 1965
B.S. Massachusetts State College, 1940; M.S. University of New Hampshire,
1942; Ph.D. Yale University, 1953; Immunochemist, Retina Foundation.
Chemistry
- Richard A. Hultin** Appointed 1967
B.S. Northeastern University, 1952; M.S. Northeastern University, 1961;
P.E. (Mass.); Group Supervisor, Raytheon Company.
Mechanical Engineering Technology
- Everett L. Hume** Appointed 1950
B.S. 1933, M.S. 1933, Massachusetts Institute of Technology; P.E. (Mass.);
Staff, Instrumentation Laboratory, Massachusetts Institute of Technology.
Civil Engineering Technology
- Mervyn Israel** Appointed 1964
B.S. Brooklyn College, 1955; M.S. University of Pennsylvania, 1956; Ph.D.
University of Pennsylvania, 1959; Research Associate, Children's Cancer
Research Foundation, The Children's Hospital Medical Center and Depart-
ment of Biological Chemistry, Harvard Medical School.
Chemistry

Charles E. Jacob Appointed 1967
 B.S.E.E. Northeastern University, 1957; B.S.Ed. University of Pennsylvania, 1961; Master, Boston Latin School.
Physics

Perry G. Jameson Appointed 1965
 B.S. Bates College, 1941; M.Ed. Boston State College, 1965; Master, Mathematics, Boston Latin School.
Mathematics

Edward Kaplan Appointed 1966
 B.S. Tufts University, 1948; P.E. (Mass.); Supervisor, Data Processing Records Development, New England Electric System.
Engineering Graphics and Computation

Britta L. Karlsson Appointed 1965
 M.T. (A.S.C.P.) Faulkner Hospital School of Medical Technology, 1957; B.S. Northeastern University, 1959; M.S. Northeastern University, 1967; Assistant Professor in Medical Technology, Biology Department, Northeastern University.
Course Consultant for Medical Technology

A. Louis Karp Appointed 1956
 A.B. Harvard College, 1927; Ed.M. Boston University, 1931; Principal, Boston School Department.
Mathematics

Leon Katler Appointed 1963
 Lowell Institute, 1949; Graduate Study, Northeastern University, 1952-1955; P.E. (Mass.); Engineer, Structural Division, Stone & Webster Engineering Corporation.
Civil Engineering Technology

Louis Katona Appointed 1959
 B.C.E. College of the City of New York, 1944; M.C.E. Polytechnic Institute of Brooklyn, 1948; P.E. (Mass. and N.Y.); Hydraulic and Sanitary Engineer, The Badger Co.
Civil Engineering Technology

Charles W. Kaufman Appointed 1958
 B.S. in Ed. Bridgewater Teachers College, 1939; Ed.M. Boston University, 1940; M.N.S. Worcester Polytechnic Institute, 1960; Guidance Counselor, Boston Latin School.
Physics

Sidney W. Kaye Appointed 1967
 B.Sc. Johns Hopkins University, 1958; Advanced Development Engineer, Sylvania Electronic Systems, Inc.
Mathematics

John T. Keiran Appointed 1957
A.B. Boston College, 1933; A.M. Harvard University, 1935; Master, Boston Latin School.
Mathematics

George F. Kent Appointed 1966
B.S. Northeastern University, 1962; M.S. Northeastern University, 1964; Staff Engineer, Dynatech Corporation.
Mechanical Engineering Technology

Nicholas P. Kernweis Appointed 1957
B.E.E. Polytechnic Institute of Brooklyn, 1952; M.S. Northeastern University, 1957; Research Physicist, Air Force Cambridge Research Laboratory.
Course Consultant for Electrical Engineering Technology

Bernard J. Kiley Appointed 1958
B.E. 1953, M.E. 1954, Yale University; P.E. (Mass.); Engineer, Jackson & Moreland Division United Engineers & Constructors, Inc.
Mechanical Engineering Technology

Mark M. Kiley Appointed 1955
B.E. Yale University, 1948; M.E. Yale University, 1949; P.E. (Mass, R.I., La.); Consulting Engineer.
Mechanical Engineering Technology

Philip D. Kingman Appointed 1964
B.S.C.E. Norwich University, 1953; LL.B. Portia Law School, 1963; Member Massachusetts Bar, 1964; P.E. (Mass.); R.L.S. (Mass.); Supervising Engineer, Boston Edison Company.
Civil Engineering Technology

John J. Klein Appointed 1950
B.S. Northeastern University, 1949; M.S. Northeastern University, 1955; Leader (Advanced Circuit Development), Aerospace Systems Division, Radio Corporation of America.
Electrical Engineering Technology

John P. Kopecki Appointed 1966
A.E. Wentworth Institute, 1962; B.S. Northeastern University, 1965; M.Ed. Northeastern University, 1967; Instructor, Northeastern University.
Engineering Graphics and Computation

Richard W. Kopka Appointed 1967
B.S.E.E. University of Pittsburgh, 1961; M.S.E.E. University of Pittsburgh, 1962; Ph.D. University of Pittsburgh, 1967; 1st Lt. U.S. Air Force; Research Laboratories.
Electrical Engineering Technology

- Paul A. Kossey** Appointed 1967
B.S.E.E. University of Pittsburgh, 1960; M.S.E.E. University of Pittsburgh, 1962; Ph.D. University of Pittsburgh, 1967; 1st Lt. U.S. Air Force; Research Engineer, Air Force Cambridge Research Center.
Electrical Engineering Technology
- Borah L. Kreimer** Appointed 1954
B.S. North Carolina State College, 1940; Ed.M. Northeastern University, 1956; Associate Professor Graphic Science, Northeastern University.
Engineering Graphics and Computation
- Malcolm D. Kruger** Appointed 1967
B.S. Northeastern University, 1962; Research Engineer, Sylvania Electronic Systems, Inc.
Engineering Graphics and Computation
- Juris Krumins** Appointed 1966
B.S. Rutgers University, 1965; M.S. Northeastern University, 1967; Instructor, Northeastern University.
Mechanical Engineering Technology
- Horatio W. Lamson** Appointed 1945
B.S. Massachusetts Institute of Technology, 1915; M.A. Harvard University, 1917; P.E. (Mass.); Research Engineer, Emeritus, General Radio Company.
Electrical Engineering Technology
- Herbert C. Lang** Appointed 1936
B.S. Northeastern University, 1934; P.E. (Mass.); Manager of Employment and Training, Mason-Neilan Division of Worthington Controls Company.
Engineering Graphics and Computation
- Robert S. Lang** Appointed 1955
B.S. Northeastern University, 1945; Ed.M. Boston University, 1954; Associate Professor of Graphic Science, Northeastern University.
Program Consultant Engineering Graphics and Computation
- Aristotle T. Laskaris** Appointed 1960
A.B. Boston University, 1954; M.S. Northeastern University, 1956; Group Leader, Avco Corporation.
Chemistry
- Clarence E. LeBell** Appointed 1955
Lowell Institute, 1940; P.E. (Mass.); Mechanical and Electrical Engineering Senior Designer, Aircraft Gas Turbine Division, General Electric Company.
Engineering Graphics and Computation
- Alvin J. Lesieur** Appointed 1965
B.S. Central Connecticut State College, 1961; M.S. Northeastern University, 1966; Instructor, Braintree High School.
Engineering Graphics and Computation

Howard Lessoff Appointed 1957
 B.S. Northeastern University, 1953; M.S. Northeastern University, 1957;
 Staff Member, National Aeronautics and Space Administration.
Chemistry

Edward T. Lewis Appointed 1967
 B.S. Tufts University, 1959; M.E.E. New York University, 1961; Staff Member,
 Sperry Rand Research Center.
Physics

Sandra M. Lictor Appointed 1967
 B.S.Ed. Salem State College, 1964; M.Ed. Salem State College, 1966; In-
 structor, Lynn English High School.
Mathematics

Demetre P. Ligor Appointed 1959
 B.S.E.E. Massachusetts Institute of Technology, 1949; P.E. (Mass.); Vice-
 President, Applied Measurements, Inc.
Physics

Warren J. Little Appointed 1967
 B.S. Boston College, 1957; M.S. Tufts University, 1960; Staff Physicist,
 Massachusetts Institute of Technology Instrumentation Laboratory.
Physics

Andrew G. Lofgren Appointed 1946
 Lowell Institute, 1932; A.A. Harvard University, 1942; Ed.M. Boston Uni-
 versity, 1946; P.E. (Mass.); Staff Appointment, Instrumentation Laboratory,
 Massachusetts Institute of Technology.
Engineering Graphics and Computation

Roger G. Long Appointed 1952
 A.E. Lincoln Technical Institute, 1950; Graduate Study, Harvard University,
 1950-51; B.B.A. Northeastern University, 1953; P.E. (Mass.); Engineering
 Manager Sylvania Electric Products, Inc.
Electrical Engineering Technology

Spencer P. Lookner Appointed 1967
 B.S. Tufts University, 1961; M.S. Northeastern University, 1966; Plant Engi-
 neer, Sanders Associates, Inc.
Mathematics

Kenneth A. Lucas Appointed 1950
 S.B. Massachusetts Institute of Technology, 1925; M.Ed. Boston University,
 1931; P.E. (Mass.); R.L.S. (Mass.); Chief of Survey, Whitman & Howard, Inc.
Civil Engineering Technology

John F. Lutkevich Appointed 1956
 A.E. Lincoln Technical Institute, 1952; B.B.A. Northeastern University, 1954;
 Senior Engineering, Sylvania Electric Products, Inc.
Engineering Graphics and Computation

Andrew C. MacAulay, Jr.

Appointed 1960

B.S. Northeastern University, 1953; M.S. Northeastern University, 1957;
 Director Core Laboratory, New England Medical Center.
Chemistry

Alvin Mandell

Appointed 1950

B.E.E. College of the City of New York, 1943; M.S.E.E. Northeastern University, 1955; P.E. (Mass.); Program Manager, Raytheon Space & Information Systems Division.
Electrical Engineering Technology

Jack I. Mann

Appointed 1960

B.S.C.E. Munich Polytech, 1951; M.S. Northeastern University, 1959; P.E. (Mass., Vermont); Senior Engineer, Jackson & Moreland Division of United Engineers & Constructors, Inc.
Mechanical Engineering Technology

Richard F. McBrien

Appointed 1967

B.S.Ed. State College at Salem, 1960; N.S.F. University of Pennsylvania, 1964; N.S.F. Clarkson College of Technology, 1965; Teacher, Lynn Public Schools.
Physics

Francis T. McCabe

Appointed 1952

B.S. University of Maine, 1917; Ed.M. Harvard University, 1928; Retired.
Engineering Graphics and Computation

Edward F. McCarren, Jr.

Appointed 1951

A.E. Lincoln Technical Institute, 1951; Engineer, Baldwin-Lima-Hamilton, Corporation.
Electrical Engineering Technology

Robert B. McDermott

Appointed 1967

B.S. Holy Cross College, 1957; M.Ed. University of Hartford, 1959; M.S. Worcester Polytechnic Institute, 1962; Instructor, Framingham North High School.
Physics

Vernon S. McFarlin

Appointed 1953

B.E.E. Northeastern University, 1931; P.E. (Mass.); Supervising Engineer, Boston Edison Company.
Mathematics

Eugene L. McLaughlin

Appointed 1956

A.B. Boston College, 1929; M.A. Boston College Graduate School, 1931; Head of Mathematics Department, Hyde Park High School.
Mathematics

Carl J. Mellea Appointed 1960
 S.B. Northeastern University, 1949; M.S. Northeastern University, 1960;
 P.E. (Mass., R.I., Maine, Vt., N.H.); Structural Engineer, Howard, Needles,
 Tammen & Bergendorff.
Civil Engineering Technology

Walter Messcher Appointed 1966
 B.M.E. City College of New York, 1963; M.S. Northeastern University, 1965;
 Engineer, NASA Electronics Research Center.
Course Consultant for Engineering Graphics and Computation

Carl Miller Appointed 1945
 A.B. Harvard University, 1929; LL.B. Boston University, 1933; Ed.M. Boston
 Teachers College, 1935; Assistant Principal, Boston School Department.
Course Consultant for Mathematics

Richard W. Miller Appointed 1959
 B.S. Northeastern University, 1958; M.S. Northeastern University, 1960; P.E.
 (Mass.); Supervisor, Engineering Flow Group, The Foxboro Company.
Mechanical Engineering Technology

Ernest E. Mills Appointed 1947
 B.S. Northeastern University, 1946; M.S. Northeastern University, 1954;
 P.E. (Mass.); Associate Professor of Mechanical Engineering, Northeastern
 University.
Program Consultant for Mechanical Engineering Technology

Theodore J. Morin, Jr. Appointed 1961
 S.B. Northeastern University, 1959; M.A. College of William and Mary, 1961;
 Research Associate in Mechanical Engineering, Northeastern University.
Physics

John K. Moulton Appointed 1965
 A.B. Harvard College, 1936; Ed.M. Harvard University, 1940; A.M. Bowdoin
 College, 1962; Mathematics Teacher, Brookline High School.
Mathematics

George Moy Appointed 1965
 B.S. Northeastern University, 1962; M.S. Northeastern University, 1964;
 Staff Engineer, Dynatech Corporation.
Mechanical Engineering Technology

Richard C. Murphy Appointed 1965
 B.S. State College at Boston, 1965; Physics Teacher, Boston English High
 School.
Physics

Robert L. Murray Appointed 1965
 A.B. Boston College, 1950; M.Ed. Boston State College, 1951; Head of
 Mathematics Department, Boston English High School.
Mathematics

Julian S. Natanson

Appointed 1957

Certificate, Franklin Technical Institute, 1941; Certificate, Lowell Institute School, 1943; P.E. (Mass.); Manager of Engineering, Bellofram Corporation.
Engineering Graphics and Computation

Donald G. Nelson

Appointed 1966

B.S.E. Fitchburg State College, 1961; M.S. Northeastern University, 1966; Instructor, Braintree High School.
Engineering Graphics and Computation

Robert L. Norton

Appointed 1967

B.S. Northeastern University, 1967; Project Engineer, Jet Spray Cooler, Inc.
Engineering Graphics and Computation

John R. O'Brien

Appointed 1946

A.B. Boston College, 1933; A.M. Boston College, 1934; Assistant Head Master, Brighton High School.
Mathematics

John C. O'Callahan

Appointed 1961

B.S. Northeastern University, 1961; M.S. Northeastern University, 1963; Instructor in Mechanical Engineering, Northeastern University.
Mechanical Engineering Technology

Ray O. Oglesby

Appointed 1967

B.S. in Ed. Illinois State University, 1954; M.S. in Ed. Illinois State University, 1955; Teacher, Weeks Junior High School.
Mathematics

Carl A. Olson, Jr.

Appointed 1964

Lowell Institute, 1938; B.S. Fitchburg State College, 1947; Ed.M. Boston University, 1951; Department Head, Wellesley High School.
Engineering Graphics and Computation

Thomas J. Owens

Appointed 1952

A.B. Boston College, 1943; M.Ed. Boston College, 1961; Instructor in Mathematics, Quincy High School.
Mathematics

Charles A. Packard

Appointed 1965

B.S. Fitchburg State College, 1935; M.E. Boston University, 1939; Ed.M. Northeastern University, 1965; Guidance Counselor, Roslindale High School.
Engineering Graphics and Computation

James A. Palmer

Appointed 1961

Electronic Technician, Northeastern University.
Electrical Engineering Technology

Burton S. Parker

Appointed 1963

B.S. Northeastern University, 1944; P.E. (Mass.); Mechanical Engineer, Army Materials and Mechanics Research Center.
Mechanical Engineering Technology

- William M. Parker** Appointed 1957
LL.B. Northeastern University, 1925; A.E. Lincoln Institute, 1956; Technical Activities Administrator, Northrop-Nortronics P.P.D.
Mathematics
- William H. Parmenter** Appointed 1952
A.E. Lincoln Technical Institute, 1948; B.B.A. Northeastern University, 1952; Instructor, Newton Technical High School.
Electrical Engineering Technology
- K. Parsons** Appointed 1967
B.A. Northeastern University, 1966; M.T. (A.S.C.P.) Choate Memorial Hospital; Medical Technologist.
Biology
- Donald Paterson** Appointed 1959
B.S. Northeastern University, 1958; M.S. Northeastern University, 1960; Senior Engineer, Missile & Space Division, Raytheon Company.
Mechanical Engineering Technology
- Joseph V. Pearincott** Appointed 1967
B.Sc. Travancore University, 1949; M.Sc. Aligarh University, 1951; Ph.D. Fordham University, 1959; Assistant Professor of Biology, Northeastern University.
Biology
- Dominic A. Piccione** Appointed 1966
B.S. Northeastern University, 1958; M.S. Northeastern University, 1960; Manager, Product Assurance Department, Avco Corporation Space Systems Division.
Mechanical Engineering Technology
- Norman C. Poirier** Appointed 1966
B.S. Northeastern University, 1963; M.S. Northeastern University, 1965; Research Associate, Northeastern University.
Electrical Engineering Technology
- Charles H. Price, Jr.** Appointed 1960
B.S. Northeastern University, 1955; M.S. Northeastern University, 1960; Senior Engineer, Itek Corporation.
Electrical Engineering Technology
- Sidney F. Quint** Appointed 1954
S.B. Northeastern University, 1946; S.M. Massachusetts Institute of Technology, 1950; P.E. (Mass.); Systems Engineer, Raytheon Company.
Electrical Engineering Technology
- Gerard H. Ratcliffe** Appointed 1955
A.B. Boston University, 1949; Research Engineer, Sylvania Electric Products, Inc.
Electrical Engineering Technology

Bernard C. Reddy

Appointed 1965

B.S. State College at Boston, 1961; M.Ed. State College at Boston, 1965;
Teacher of Science, Brighton High School.
Course Consultant for Physics

Edward L. Rich

Appointed 1956

B.S. Northeastern University, 1952; M.S. Northeastern University, 1956;
P.E. (Mass.); Manager, Sylvania Electric Products, Inc.
Mechanical Engineering Technology

William Richmond

Appointed 1964

B.S. Boston College, 1937; Ed.M. Harvard University, 1956; Physics In-
structor, Everett High School.
Mathematics

W. Robinson

Appointed 1967

A.S. University of Florida; B.S. Oglethorpe University, Medical Technologist,
VA Hospital.
Biology

Bertram Rockower

Appointed 1967

B.S.M.E. Columbia University, 1949 ;M.S.M.E. Northeastern University, 1964;
Group Leader, M.I.T. Instrumentation Laboratory.
Mechanical Engineering Technology

Fred A. Rosenberg

Appointed 1967

A.B. New York University, 1953; Ph.D. Rutgers University, 1960; Associate
Professor Biology, Northeastern University.
Program Consultant Biology

Walter H. Rowell, Jr.

Appointed 1964

B.S. Northeastern University, 1958; P.E. (Mass., Vermont); Senior Electrical
Engineer, Jackson & Moreland Division of United Engineers & Constructors,
Inc.
Electrical Engineering Technology

Eric A. Roy

Appointed 1967

B.A. Clark University, 1938; M.Ed. Clark University, 1939; Instructor, Boston
English High School.
Mathematics

Thomas E. Ruden

Appointed 1967

B.S. Polytechnic Institute of Brooklyn, 1957; M.S. Northeastern University,
1961; President, Microwave Power Technology Company.
Physics

Leo D. Salvucci

Appointed 1965

A.B. Boston College, 1951; M.Ed. Boston College, 1958; Teacher of Mathe-
matics, Boston Latin School.
Mathematics

- Costa Samar** Appointed 1965
B.S. Boston University, 1956; M.S.T. University of Arizona, 1966; Mathematics Teacher, Needham High School.
Mathematics
- David R. Samsury** Appointed 1967
B.S.M.E. Northeastern University, 1966; Teaching Assistant, Northeastern University.
Mechanical Engineering Technology
- Richard L. Savage** Appointed 1955
B.S. University of Maine, 1950; M.S. Northeastern University, 1955; P.E. (Mass.); Associate Professor of Civil Engineering, Tufts University; Consulting Engineer.
Mechanical Engineering Technology
- Donald S. Scheufele** Appointed 1962
B.S. Tufts University, 1949; M.S. Tufts University, 1950; Ph.D. University of Massachusetts, 1958; Research Associate, Retina Foundation.
Chemistry
- Henry Schwartz** Appointed 1958
A.B. University of California, 1939; M.Ed. State College, North Adams, 1944; P.E. (Mass.); Field Engineer.
Physics
- Robert T. Schwartz** Appointed 1966
B.S. Massachusetts Institute of Technology, 1958; M.S. Northeastern University, 1962; P.E. (Mass.); Project Engineer, Raytheon Company.
Electrical Engineering Technology
- Myron R. Segelman** Appointed 1966
B.S. Mass College of Pharmacy, 1954; M.S. Mass College of Pharmacy, 1956; Associate Professor, Department of Biology, State College at Boston.
Medical Technology
- Robert I. Serody** Appointed 1967
S.B.E.E. Pennsylvania State University, 1959; M.S.E.E. Drexel Institute of Technology, 1963; Senior Engineer, Raytheon Company.
Electrical Engineering Technology
- Ralph W. Sexton** Appointed 1966
B.S. Northeastern University, 1949; M.S. Northeastern University, 1955; P.E. (Mass., N.H.); Assistant Professor of Mechanical Engineering, Northeastern University.
Mechanical Engineering Technology
- Irwin S. Shair** Appointed 1967
B.S.E.E. Northeastern University, 1958; M.S.E.E. Northeastern University, 1967; Advanced Development Engineer, Sylvania Electric Products, Inc.
Electrical Engineering Technology

Harold M. Sharaf

Appointed 1955

B.S., M.S. Massachusetts Institute of Technology, 1952; President, Tenco Electronics, Inc.

Course Consultant for Electrical Engineering Technology

Irwin Shear

Appointed 1967

A.B. Brooklyn College, 1951; M.S. Northeastern University, 1961; Engineer Space Programming, Raytheon Company.

Engineering Graphics and Computation

William M. Sherry

Appointed 1962

B.S. Boston College, 1955; M.S. University of New Hampshire, 1957; Research Physicist, Avco Corporation.

Physics

Walter S. Shields

Appointed 1966

B.S. Boston College, 1961; Ed.M. State College at Boston, 1966; Instructor, Needham Public Schools.

Mathematics

Charles Siegel

Appointed 1967

A.B. Bates College, 1929; M.A. Bates College, 1939; Instructor, Needham Senior High School.

Mathematics

George B. Smith

Appointed 1967

B.S.E.E. University of Massachusetts, 1958; Design Engineer, Raytheon Company.

Electrical Engineering Technology

Frank E. South

Appointed 1965

B.S.E.E. Worcester Polytechnic Institute, 1932; Administrative Manager, Worthington Controls Company.

Engineering Graphics and Computation

S. Leonard Spitz

Appointed 1955

B.S. Northeastern University, 1946; M.S. Northeastern University, 1967; P.E. (Mass.); Staff Engineer, Itek Corporation.

Mechanical Engineering Technology

Benjamin R. Stahl

Appointed 1966

A.B. Eastern Nazarene College, 1950; Senior Engineer — Research, Raytheon Company.

Engineering Graphics and Computation

Donald L. St. Andre

Appointed 1967

B.S. Boston College, 1949; M.Ed. Boston College, 1955; Head Mathematics Department, Framingham North High School.

Mathematics

- Joseph E. Steffano** Appointed 1965
B.S. Northeastern University, 1959; M.S. Northeastern University, 1964;
P.E. (Mass.); R.L.S. (Mass.); General Manager, Yunits Engineering Company.
Civil Engineering Technology
- Elwood M. Stoddard** Appointed 1964
B.S. Boston University, 1941; Ed.M. Boston University, 1950; Former Head
of Mathematics Department, Hingham Public School. (Retired 1965.)
Mathematics
- M. Carlton Storms** Appointed 1967
B.A. Bowdoin College, 1957; M.Ed. Northeastern University, 1964; Teacher,
Thayer Academy.
Physics
- Raimundas Sukys** Appointed 1962
B.S. Northeastern University, 1958; M.S. Northeastern University, 1961;
Research Associate in Electrical Engineering, Northeastern University.
Electrical Engineering Technology
- David M. Sumner** Appointed 1966
B.S. Northeastern University, 1962; Instructor, King Philip Regional High
School.
Engineering Graphics and Computation
- John L. Swanson** Appointed 1966
B.S.M.E. Northeastern University, 1966; M.S.M.E. Northeastern University,
1967.
Mechanical Engineering Technology
- Jason R. Taylor** Appointed 1966
B.S. Massachusetts Institute of Technology, 1958; M.S. Northeastern Uni-
versity, 1963; Staff Scientist, Avco Corporation.
Mathematics
- Maurice Temple** Appointed 1956
B.S. Northeastern University, 1947; M.Ed. Boston State College, 1952;
M.S. Simmons College, 1965; Associate Professor of Physical Science, Boston
State College.
Mathematics
- Robert L. Thing** Appointed 1957
B.S. 1943, M.S. 1951, University of Illinois; Development Engineer, Astro-
nautical Research Company.
Electrical Engineering Technology
- Carolyn M. Thomas** Appointed 1967
B.A. University of Maine, 1963; Doctoral Candidate, Northeastern University;
Research Chemist, U.S. Army Natick Laboratories.
Chemistry

Joseph Tierney Appointed 1967
 S.B. & S.M. Massachusetts Institute of Technology, 1956; Staff, Massachusetts Institute of Technology Lincoln Laboratory.
Electrical Engineering Technology

Phineas Tobe Appointed 1960
 A.B. Harvard College, 1932; Ed.M. Boston Teachers College, 1935; Head of Science Department, Girls' Latin School.
Physics

Richard W. Torian Appointed 1967
 B.S.Ed. Northeastern University, 1959; M.Ed. Northeastern University, 1964; Acting Mathematics Department Chairman, Ashland Senior High School.
Mathematics

K. Endre Toth Appointed 1967
 S.B. Massachusetts Institute of Technology, 1965; Instructor, Northeastern University.
Engineering Graphics and Computation

John S. Travia Appointed 1965
 B.S. Northeastern University, 1958; M.S. Northeastern University, 1964; P.E. (Mass.); Senior Engineer, Raytheon Company.
Electrical Engineering Technology

Arthur M. Vuilleumier Appointed 1953
 Head of Electronics Department, Blue Hills Regional Vocational Technical High School.
Electrical Engineering Technology

Richard Wadler Appointed 1953
 A.E. Lincoln Technical Institute, 1947; P.E. (Mass.); Senior Mechanical Engineer, Raytheon Co., Missile and Space Division.
Mechanical Engineering Technology

Ronald A. Wagner Appointed 1967
 B.S. Northeastern University, 1961; M.S. Northeastern University, 1966; Research Associate, Northeastern University.
Electrical Engineering Technology

Thomas H. Wallace Appointed 1941
 S.B. Boston University, 1933; M.A. Harvard Graduate School, 1936; Ph.D. Boston University, 1939; Professor of Physics, Northeastern University.
Program Consultant for Physics

John E. Walsh Appointed 1947
 A.B. St. Michael's College, 1938; A.M. Boston University, 1940; Staff Consultant, Bedford Laboratory, Raytheon Company.
Mathematics

Frank S. Weinert

Appointed 1957

A.B. Harvard College, 1948; B.S. Columbia University, 1951; M.S. Columbia University, 1952; Optometrist; Chairman of Mathematics Department, Dana Hall School.

Mathematics

Morton D. Weinert

Appointed 1955

A.B. Harvard University, 1938; Ed.M. Boston Teachers College, 1939; M.Ed. Harvard University, 1963; Head of the Mathematic Department, Boston Latin School.

Mathematics

George B. Welch

Appointed 1946

B.S. Bowdoin College, 1922; Ph.D. Cornell University, 1928; Professor Emeritus of Physics, Northeastern University.

Course Consultant for Physics

Ralph A. Wellings

Appointed 1955

B.S. Boston College, 1955; M.Ed. State College at Boston, 1960; Mathematics Instructor, Boston Latin School.

Mathematics

Ralph E. Wellings

Appointed 1944

A.B. Boston College, 1920; A.M. Boston College, 1925; Ed.M. Boston Teachers College, 1930; Head of Science Department, Brighton High School.

Physics

Melvin D. White

Appointed 1967

B.S.C.E. Howard University, 1966; Instructor, Northeastern University.

Engineering Graphics and Computation

Thomas F. White

Appointed 1957

B.S. Mathematics, Boston College, 1951; B.S.M.E.E. Massachusetts Maritime Academy, 1952; M.Ed. Bridgewater State Teachers College, 1952; M.A. Boston College, 1965; Head Mathematics Department, Quincy High School.

Mathematics

Willard B. Whittemore

Appointed 1957

B.S. in C.E., Massachusetts Institute of Technology, 1932; Ed.M. Boston University, 1946; C.A.G.S. Boston University, 1956; Head Mathematics Department, Everett High School.

Course Consultant for Mathematics

Rudolph P. Widman

Appointed 1963

A.B. Eastern Nazarene College, 1963; M.S. Northeastern University, 1965; Instructor of Chemistry, Curry College.

Chemistry

Raymond L. Wiggins

Appointed 1967

B.A. San Jose State College, 1964; Graduate Work University of Santa Clara;
Senior Systems Analyst, Raytheon Company.

Engineering Graphics and Computation

Joseph F. Willard

Appointed 1949

B.S. Northeastern University, 1949; P.E. (Mass.); R.L.S. (Mass.); Principal
Civil Engineer, Electronic Computer Section, Massachusetts Department of
Public Works.

Civil Engineering Technology

Zenora Williams

Appointed 1967

B.S. Bennett College; M.S. Howard University; Massachusetts Institute of
Technology Biology Research Department.

Biology

Donald K. Willim

Appointed 1961

B.S. Maryland University, 1957; M.S. Northeastern University, 1961; P.E.
(Mass.); Staff, Massachusetts Institute of Technology, Lincoln Laboratory.

Physics

Albert G. Wilson, Jr.

Appointed 1948

B.S. in Civil Engineering, Thayer School, Dartmouth, 1946; M.S. Case
Institute of Technology, 1948; P.E. (Mass.); S.E. (Ill.); Member Gilbert
Small & Co., Consulting Engineers.

Course Consultant for Mechanical Engineering Technology

Gerald L. Woodland, Jr.

Appointed 1966

B.S. University of Massachusetts, 1957; M.S. Northeastern University, 1959;
P.E. (Mass, New York); Engineer, Structural Division, Stone & Webster
Engineering Corporation.

Engineering Graphics and Computation

Robert D. Wright

Appointed 1955

A.E. Lincoln Institute, 1955; Graduate Study, Northeastern University; Senior
Project Member, Aerospace Systems Division, Radio Corporation of America.

Electrical Engineering Technology

Walter P. Zanor

Appointed 1967

B.S.B.A. Boston College, 1959; Instructor, Everett High School.

Mathematics

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Northeastern University
Lincoln College

360 Huntington Avenue

Boston, Massachusetts 02115

19

I should like further information about Lincoln College.

Will you please arrange for me to have an interview to discuss your
program in _____

I shall arrange to submit transcripts of my records at all schools
attended since high school.

Signature

Street Address

City

State

Zip Code

NORTHEASTERN UNIVERSITY

UNDERGRADUATE COLLEGES

Offering full-time day curricula on the Cooperative Plan leading to baccalaureate degrees

Boston-Bouvé College

College of Business Administration

College of Criminal Justice

College of Education

College of Engineering

College of Liberal Arts

*College of Nursing

College of Pharmacy

Offering part-time curricula during late afternoon and evening hours leading to associate and baccalaureate degrees

Lincoln College

University College

GRADUATE DIVISION

Offering graduate curricula leading to master's degrees

Graduate School of Actuarial Science

**Graduate School of Arts and Sciences

Graduate School of Business Administration

Graduate School of Education

**Graduate School of Engineering

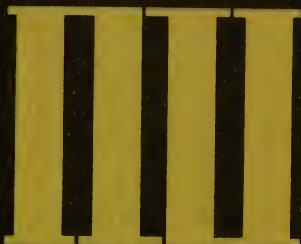
Graduate School of Pharmaceutical Sciences

Graduate School of Professional Accounting

*Also offers a three-year Cooperative Program leading to the associate degree.

**Also offers doctoral programs in certain fields.





**NORTHEASTERN
UNIVERSITY**



BULLETIN 1968-1969

**graduate school
of
arts and sciences**



**NORTHEASTERN
UNIVERSITY**

NORTHEASTERN UNIVERSITY
360 HUNTINGTON AVENUE
BOSTON, MASSACHUSETTS 02115



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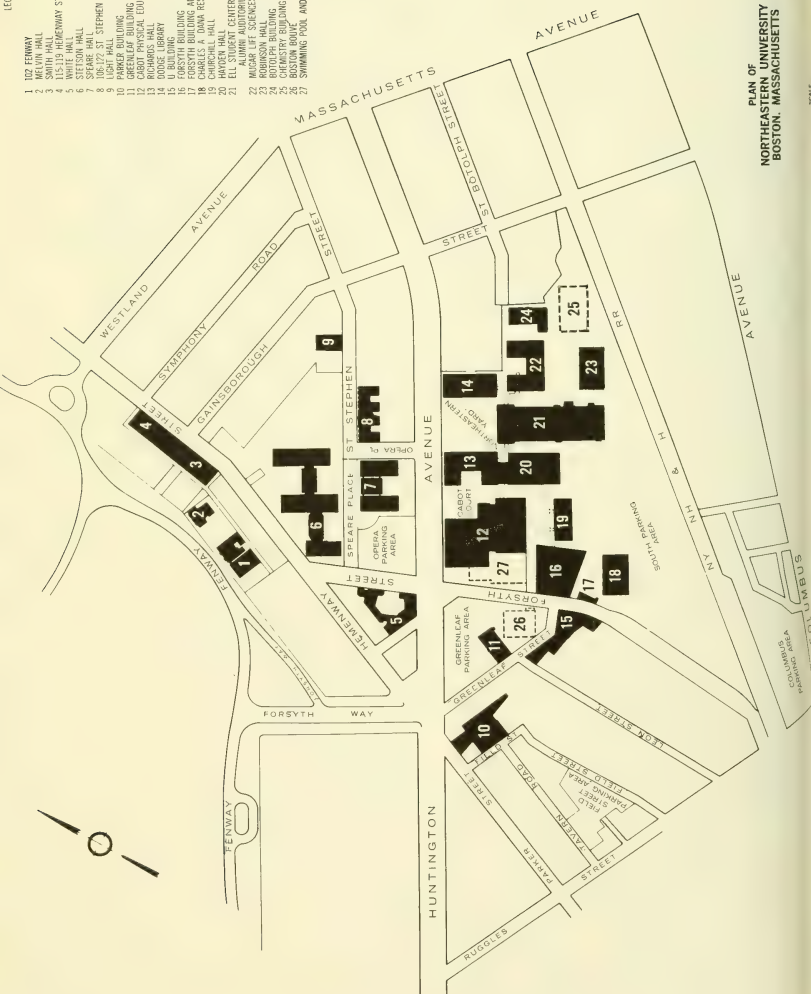
**graduate school
of
arts and sciences**



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- 8 106-122 ST. STEPHEN STREET
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- 24 ROBINSON HALL
- 25 ROBINSON HALL
- 26 ROBINSON HALL
- 27 BOSTON BOULEVARD
- 28 SWIMMING POOL AND HANDBALL FACILITIES



ACADEMIC CALENDAR 1968-69

Summer Session 1968

Registration Period for Former Students	Monday-Friday	May 27-June 7
Interview and Registration Period for New Students*	Monday-Friday	May 27-June 7
Classes Begin	Monday	June 17
Independence Day, No Classes	Thursday	July 4
Classes End	Tuesday	July 23
Examination Period	Wednesday-Saturday	July 24-July 27

Fall Quarter 1968

Registration Period for Former Students	Monday-Saturday	Aug. 12-Aug. 31
Interview and Registration Period For New Students*	Monday-Saturday	Aug. 19-Sept. 7
Classes Begin	Monday	Sept. 16
Columbus Day, No Classes	Saturday	Oct. 12
Veterans' Day, No Classes	Monday	Nov. 11
Thanksgiving Recess, No Classes	Tuesday-Friday	Nov. 26-29
Examination Period†	Monday-Friday	Dec. 2-6

Winter Quarter 1968-69

Change for Registration for Former Students	Wednesday-Wednesday	Nov. 20-Nov. 27
Interview and Registration Period for New Students*	Wednesday-Wednesday	Nov. 20-Nov. 27
Classes Begin	Monday	Dec. 9
Christmas Vacation, No Classes	Saturday-Wednesday	Dec. 21-Jan. 1
Washington's Birthday, No Classes	Saturday	Feb. 22
Examination Period	Monday-Friday	March 3-March 7

Spring Quarter 1969

Change of Registration for Former Students	Monday-Friday	Feb. 24-Feb. 28
Classes Begin	Monday	March 17
Patriots' Day, No Classes	Saturday	Apr. 19
Final Grades due in Registrar's Office for June Graduates Taking Third-Quarter Courses	Friday	May 23
Memorial Day, No Classes	Friday	May 30
Examination Period	Monday-Friday	June 2-June 6

*Appointments for interviews with new students must be made at least four days before the date of the interview.

†Examinations for day classes will be held in accordance with the undergraduate examination schedule.

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UNIVERSITY GRADUATE COUNCIL

1967-68

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(Terms Expire September 1968)

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John F. Dunn	Professor of Mechanical Engineering
George M. Krause	Professor of Pharmacy
Robert W. Mullins	Associate Professor of Management
Robert J. Minichiello	Associate Professor of Marketing
Harold R. Raemer	Professor of Electrical Engineering and Chairman of the Department
Raymond H. Robinson	Professor of History and Chairman of the Department
George B. Rochfort, Jr.	Associate Professor of Education
Elliot Spector	Professor of Pharmacology
A. Bertrand Warren	Professor of Psychology and Chairman of the Department

(Terms Expire September 1969)

James T. Barrs	Professor of English
Robert J. Ferullo	Associate Professor of Special Education
Austin W. Fisher	Professor of Engineering Management
Bernard M. Goodwin	Associate Professor of Chemical Engineering
Melvin Howards	Director of the Center for Educational Development
A. Howard Myers	Professor of Industrial Relations
John F. Reinhard	Professor of Pharmacology and Chairman of the Department
John N. Samaras	Associate Professor of Management
Robert A. Shepard	Professor of Chemistry and Chairman of the Department
Albert H. Soloway	Associate Professor of Medicinal Chemistry

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GRADUATE SCHOOL OF ARTS AND SCIENCES**

1967-68

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Frank F. Lee	Professor of Sociology and Chairman of the Department
Samuel F. Morse	Professor of English
Raymond H. Robinson	Professor of History and Chairman of the Department
Robert A. Shepard	Professor of Chemistry and Chairman of the Department
A. Bertrand Warren	Professor of Psychology and Chairman of the Department
Roy Weinstein	Professor of Physics

Aims and Scope of the University

Founded in 1898, Northeastern University is incorporated as a privately endowed nonsectarian institution of higher learning under the General Laws of Massachusetts. The State Legislature by special enactment has given the University general degree-granting powers. The University is governed by a Board of Trustees elected by and from the Northeastern University Corporation, which is composed of more than 150 distinguished business and professional men.

From its beginning Northeastern University has had as its dominant purpose the discovery of community educational needs and the meeting of these in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has sought to pioneer new areas of educational service.

A distinctive feature of Northeastern University is its Cooperative Plan, initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922), Liberal Arts (1935), Education (1953), Pharmacy (1962), Nursing (1964), and Boston-Bouvé College (1964). This educational method enables students to gain valuable practical experience as an integral part of their college programs and also provides the means by which they may contribute substantially to the financing of their education. The Plan has been extended to the graduate level in engineering, mathematics, sociology, actuarial science, the pharmaceutical sciences, and professional accounting.

In the field of adult education, programs of study have been developed to meet a variety of needs. Since 1906 evening curricula have been offered leading to the bachelor's degree. Programs in the arts and sciences, engineering, various fields of business, law enforcement and security, and other areas have been carefully planned to serve mature students who are employed full time during the day and want to broaden their educational background by part-time study. All formal courses of

study leading to degrees through evening programs are approved by the Basic College faculties concerned and are subject to the same quantitative and qualitative standards as the regular day curricula.

The following is a brief outline of the aims and scope of the University's programs.

UNDERGRADUATE COLLEGES

BOSTON-BOUVÉ COLLEGE

Boston-Bouvé College offers three major programs of study — physical education, recreation education, and physical therapy. Students earn the degree of Bachelor of Science in Education.

The combined programs of liberal arts, science, and professional preparation include field experience and student teaching, and leadership training in camping and outdoor education at the Warren Center for Physical Education and Recreation in Ashland. In accordance with Northeastern's Cooperative Plan of Education, students are offered varied opportunities for alternate plans of work-study experience during upper-class years.

THE COLLEGE OF BUSINESS ADMINISTRATION

The College of Business Administration offers programs of study in the principal fields of business leading to the degree of Bachelor of Science in Business Administration. These programs are offered on the five-year Cooperative Plan, under which students gain substantial practical experience in the fields for which they are preparing as an integral part of their undergraduate course of study.

The College also sponsors a Management Institute which offers various special courses for business and industrial executives. One phase of the Institute's work is carried on by the Center for Management Development, which annually conducts an intensive program designed to provide professional growth for middle-management executives who will ultimately be called upon to carry broader executive responsibilities. The plan of instruction, based on a modification of the Northeastern Cooperative Program, permits the participants to maintain their job responsibilities during the six-month period of the course. The Management Development Program is conducted at Andover, Massachusetts, on the campus of Andover Academy.

A Bureau of Business and Economic Research, concerned particularly with problems of the New England region, is an integral part of the College. The Bureau conducts research projects under faculty leadership using undergraduate and graduate cooperative students as research assistants.

COLLEGE OF CRIMINAL JUSTICE

The College of Criminal Justice offers full-time day curricula on the Cooperative Plan leading to the degree of Bachelor of Science with concentration in the field of law enforcement.

THE COLLEGE OF EDUCATION

The College of Education offers programs leading to the degree of Bachelor of Science in Education. These are designed particularly to meet the needs of high school graduates who desire to prepare themselves for teaching or administrative positions in elementary and secondary schools. Curricula are offered on the five-year Cooperative Plan, which provides for employment in libraries, social service agencies, and school systems.

THE COLLEGE OF ENGINEERING

The College of Engineering offers five-year cooperative curricula in civil, mechanical, electrical, chemical, industrial, and biomedical engineering leading to the degree of Bachelor of Science with specification according to the engineering department in which the student qualifies. A six-year program in power systems engineering in collaboration with public utilities leads to both the bachelor's and master's degree in electrical engineering. The College also offers during evening hours a part-time program leading to the degree of Bachelor of Science in Electrical Engineering. This program extends over eight years, covers the identical courses given in the day cooperative curriculum, and meets the same qualitative and quantitative standards of scholarship.

THE COLLEGE OF LIBERAL ARTS

The College of Liberal Arts offers majors in the usual field of the arts and sciences leading to the degree of Bachelor of Arts. With the exception of preprofessional programs, curricula are normally five years in length and operated on the Cooperative Plan.

LINCOLN COLLEGE

Lincoln College offers technology programs leading to the Associate in Engineering and Bachelor of Engineering Technology degrees. It also offers science technology and paramedical technology programs leading to the Associate in Science degree.

In addition to its traditional curricula, Lincoln College offers interdisciplinary and certificate programs providing technological and professional

development opportunities to meet the special needs of part-time students.

THE COLLEGE OF NURSING

The College of Nursing offers two separate and distinct programs of study, both organized on the Cooperative Plan:

- (a) A three-year curriculum in preparation for the R.N. Examinations and leading to the Associate in Science degree.
- (b) A five-year curriculum also preparing students for the R.N. Examinations, and leading to the degree of Bachelor of Science in Nursing.

Five of Boston's leading hospitals — Beth Israel, Children's Hospital Medical Center, New England Deaconess, Peter Bent Brigham, and Massachusetts General — collaborate with Northeastern by providing suitable cooperative work opportunities during the upper-class years of these programs.

THE COLLEGE OF PHARMACY

The College of Pharmacy offers five-year cooperative curricula leading to the degree of Bachelor of Science in Pharmacy. Cooperative placement begins with the sophomore year and continues for three years, the senior year being devoted to full-time study at the University.

UNIVERSITY COLLEGE

University College, so called because it draws upon the resources of the other colleges of the University, offers courses of study leading to certificates, Associate in Science and Bachelor of Science degrees. University College offers both day and evening programs designed specifically to meet the needs of adult students who wish to undertake part-time curricula during late afternoon or evening hours and on Saturdays. In cooperation with the Forsyth School for Dental Hygienists, University College offers a two-year day curriculum leading to the Associate in Science degree.

Quality standards of instruction and requirements for the degrees offered by University College are wholly consistent with those of the other colleges of the University. University College does not duplicate the offerings of the eight Basic Colleges but provides curricula which cut across traditional subject-matter areas to meet the particular needs of adults desiring formal programs of professional development on a part-time basis, or of young people enrolled in professional schools affiliated with Northeastern University.

THE GRADUATE DIVISION

The Graduate Division of the University offers day and evening programs. It is made up of the following Graduate Schools, which offer programs leading to the degrees listed:

ACTUARIAL SCIENCE

Master of Science in Actuarial Science.

ARTS AND SCIENCES

Master of Arts, Master of Science, Doctor of Philosophy.

BUSINESS ADMINISTRATION

Master of Business Administration.

EDUCATION

Master of Education.

ENGINEERING

Master of Science with course specification, including a special six-year program in power systems engineering leading to both bachelor's and master's degrees in Electrical Engineering; a similar six-year program in mechanical engineering leading to both bachelor's and master's degrees; and Doctor of Philosophy degree in the fields of Electrical, Chemical, and Mechanical Engineering.

PHARMACEUTICAL SCIENCES

Master of Science with specialization in hospital pharmacy, industrial pharmacy, medicinal chemistry, and pharmacology.

PROFESSIONAL ACCOUNTING

A five-quarter curriculum leading to the degree of Master of Science in Accounting.

Some of these programs are offered on the Cooperative Plan; others provide teaching and research fellowships for able candidates. Administrative headquarters for all graduate programs are located in Churchill Hall.

CENTER FOR CONTINUING EDUCATION

The Center for Continuing Education was established to relate the University to the needs of its community in a period of accelerated change. Its programs are composed of seminars, conferences, institutes, forums, and a wide variety of special courses designed to serve specific needs. The Division of Special Programs, working cooperatively with trade associations and professional societies, offers a wide variety of programs dealing with current needs and problems. Through its Division of Community Services, working with governmental agencies and community organizations, the Center is becoming increasingly involved in social problems on both the local and national level.

Many of these programs are conducted at Henderson House, Northeastern University's conference center in Weston, Massachusetts.

AFFILIATED PROGRAMS

FOR DENTAL HYGIENISTS

The Forsyth School for Dental Hygienists conducts a two-year program of dental hygiene education and general education in cooperation with Northeastern University. Graduates of the program receive the Certificate in Dental Hygiene from Forsyth and the degree of Associate in Science from Northeastern.

FOR MEDICAL TECHNOLOGISTS

In cooperation with the New England Baptist and the New England Deaconess Hospitals, Northeastern University offers a full-time day program on the Cooperative Plan leading to the degree of Bachelor of Arts.

FOR NURSES

Northeastern University offers instruction in the sciences, humanities, and social studies for student nurses from the New England Deaconess and Children's Hospital Medical Center Schools of Nursing.

RESEARCH ACTIVITIES

The faculties of the University are engaged in a wide variety of basic research projects in business, science, social science, pharmacy, and engineering. These are coordinated by the Dean of Research, whose services are University-wide and available to the faculties of all the Colleges.

Although Northeastern is primarily concerned with undergraduate and graduate instruction, the University believes that the most effective teaching and learning takes place in an environment characterized by research activities directed toward extending the frontiers of knowledge.



Buildings and Facilities

MAIN CAMPUS

The main campus of Northeastern University is located at 360 Huntington Avenue in the Back Bay section of Boston. Many of the city's famous cultural, educational, and philanthropic institutions are situated in the Back Bay, including the Museum of Fine Arts, Symphony Hall, Horticultural Hall, the Isabella Stewart Gardner Museum, the Harvard teaching hospitals, and many schools and colleges. Most are within walking distance of Northeastern University.

Major transportation facilities serving the Boston area are Logan International Airport, two rail terminals, bus terminals serving inter- and intrastate lines, and MBTA subway-bus service within the metropolitan-suburban area. There is a subway stop in front of the campus. For motorists, the best routes to the campus are the Massachusetts Turnpike (Exit 22) and Route 9, of which Huntington Avenue is the intown section.

The campus of 47 acres is divided by Huntington Avenue, with the main educational buildings on one side and dormitories on the other. The principal buildings, all of which have been constructed since 1938, are of glazed brick in contemporary classic style. Most are interconnected by underground passageways.

CARL S. ELL STUDENT CENTER

The Carl S. Ell Student Center provides facilities for student recreation and for extracurricular activities. The Alumni Auditorium, with a seating capacity of 1,300, is part of the Center. Also included are special drama facilities, a ballroom, main lounge, fine arts exhibition area, student offices, conference rooms, and a dining area seating more than 1,000.

THE UNIVERSITY LIBRARY

The Dodge Library is the main library on the Boston campus and maintains an open-stack system. Bound volumes in the library system exceed 190,000, and microfilm titles, 250,000. Collections are located in these areas:

1. The General Collection in the book stacks as indicated by the classification number given in the upper left corner of the catalog card.
2. The Reference Collection in the Cabot Reading Room to the left of the Circulation Desk, which includes bibliographies, government documents, maps, company publications, the information file, association publications, and theses.
3. The Periodical Collection on the basement level occupying the lower Reading Room and the first two back-stack levels.
4. The Reserve Book Collection adjacent to the Periodical Room on the basement level.
5. The Foreign Literature Collections in the Webster Reading Room to the right of the Circulation Desk.
6. The Audio-Facility Division consisting of sound recordings and magnetic tapes for instructional and individual use in the Richardson Room on the second floor.
7. The American and English Literature Collections in the new Literature Reading Room.
8. The Humanities Collection (Philosophy, Psychology, Religion) in Rooms 202 and 203D.
9. The Microtext Collection housed on the basement level adjacent to the periodical room. This collection includes 300,000 titles in micro-print, microfilm, and microfiche forms.

The Card Catalog is a union list of materials in the University Library and is located in the Webster Reading Room.

The Circulation Department has an IBM card file of all students attending the University. To borrow materials, students should present university identification at the Circulation Desk. For extensive research, where it is not possible for the University Library to acquire materials, the inter-library loan system allows the acquisition of items from other collections throughout the country.

Library Hours

Monday — Thursday	7:45 a.m. to 10:00 p.m.
Friday	7:45 a.m. to 7:30 p.m.
Saturday	8:30 a.m. to 4:00 p.m.

The reading rooms on the second floor are open until 1 a.m., Monday-Friday. The library is open Sundays and holidays from 1:00 to 10:00 p.m.

The University Library System includes two libraries in the Division of Research. Physics-Electrical Engineering is housed in 325 Dana Research Center and Chemistry-Mathematics is housed on the fifth floor of the United Realty Building.

SUBURBAN CAMPUS

The Suburban Campus, located near the junction of Routes 128 and 3 in Burlington, Massachusetts, was established to meet the needs of individuals and of industry in the area.

In addition to graduate courses in engineering, physics, mathematics, business administration, science, education, and the arts, portions of undergraduate programs leading to the associate and bachelor's degrees, special programs for adults, and non-credit state-of-the-art programs are offered.

HENDERSON HOUSE

The University's conference center, Henderson House, is located in Weston, Massachusetts. The Center for Continuing Education conducts short-term courses, seminars, and special institutes for business, professional, and research groups. Henderson House is 12 miles from the main campus.

WARREN CENTER

The Warren Center for Physical Education and Recreation in Ashland, Massachusetts, serves as a year-round outdoor laboratory for students in Boston-Bouvé College. There are facilities for conferences, special education in arts and crafts, and sports, including aquatics. Buildings include a lodge, cottages, and an infirmary.

MARINE SCIENCE INSTITUTE

The Marine Science Institute at Nahant, Massachusetts, is a research and instructional facility primarily engaged in studies of marine biology and oceanography. The Institute is operated all year, and is about 20 miles northeast of Boston.

GRADUATE SCHOOL



GRADUATE SCHOOLS AND DEGREE PROGRAMS

Graduate School of Actuarial Science

Master of Science in Actuarial Science

Graduate School of Arts and Sciences

Master of Arts Degrees

in the fields of

Economics, English, History, Political Science,
Psychology, and Sociology-Anthropology

Master of Science Degrees

in the fields of

Biology, Chemistry, Health Sciences,
Mathematics, and Physics

Doctor of Philosophy Degrees

in the fields of

Biology, Chemistry, Mathematics,
Physics, Psychology, and Sociology

Graduate School of Business Administration

Master of Business Administration

Graduate School of Education

Master of Education

Graduate School of Engineering

Master of Science Degrees

in the fields of

Chemical, Civil, Electrical, Industrial,
and Mechanical Engineering, and
Engineering Management

Doctor of Philosophy Degrees

in the fields of

Chemical, Electrical, and Mechanical Engineering

Graduate School of Pharmaceutical Sciences

Master of Science in Hospital Pharmacy

Master of Science in Industrial Pharmacy

Master of Science in Medicinal Chemistry

Master of Science in Pharmacology

Graduate School of Professional Accounting

Master of Science in Accounting

General Graduate Division Regulations

REGISTRATION

Students must register in the Graduate Division Office at the times specified by the Graduate School calendar.

RESIDENCE

All work for advanced degrees must be completed in residence at the University unless approval has been obtained from the Dean of the Graduate Division for work taken elsewhere. Students who are in residence and are using the facilities of the University must register for such work.

PROGRAMS OF STUDY

At the time of his first registration, each full-time student must develop, with the assistance of his faculty adviser, a complete program of study for the degree for which he is registered. All subsequent changes must be approved by his faculty adviser.

Evening part-time students will be expected to complete the required courses outlined by each department, after which the elective courses may be undertaken. The study load for such students is limited to a program of two courses per quarter unless special permission to carry a heavier load is given by the director of the graduate school concerned.

GRADING SYSTEM

The performance of students in graduate courses will be recorded by the instructor by use of the following grades:

A. Excellent

This grade is given to those students whose performance in the course has been of very high graduate caliber.

B. Satisfactory

This grade is given to those students whose performance in the course has been at the level necessary for graduate credit.

C. Fair

This grade is used to indicate that the student's performance in the course may be acceptable but is not consistently at the level expected in graduate work.

F. Failure

This grade is used to indicate unsatisfactory work.

In addition, the following letter designations are used:

- I. Incomplete, without quality designation. This is used when a student does not take the final examination or otherwise fails to complete the work of the course.
- S. Satisfactory, without quality designation. This designation may be used for thesis and seminar work.
- W. Withdrawn without prejudice.

The designation "I" will be changed to a grade upon removal of the deficiencies which caused the grade of "I" to be reported. Such deficiencies must be removed within four weeks after the quarter ends, or the grade of "I" will be changed to a grade of "F." If the deficiencies are due to a missed final examination, permission to take a make-up must be obtained from the director of the respective graduate school within one week following the date of the missed examination, and the examination must be made up at the time specified by the Graduate Division.

WITHDRAWALS

In order to withdraw from a course, a student must fill out an official withdrawal form obtained at the Graduate Division Office or at the Burlington Campus Office. Withdrawals may be made through the ninth week of the quarter. Students will be withdrawn as of the date on which they fill out the form. Ceasing to attend a class or notifying the instructor does not constitute an official withdrawal.

Students who do not attend the first two class sessions and who do not notify the Graduate Division of their intention to withdraw will be dropped from the class for nonattendance.

Requests for withdrawal from a course after the ninth week of the quarter may be submitted to the Director of the appropriate Graduate School, and may be approved to avert unusual hardships on a student.

CLASS HOURS AND CREDITS

All credits are entered as quarter hours. A quarter hour of credit is equivalent to three fourths of a semester hour credit. All classes meet on a quarter basis. In the summer session, classes meet for six-week periods. The academic calendar for each graduate school should be consulted in order to determine the opening and closing dates of the sessions.

THE MASTER'S DEGREE

Admission

Specific requirements for each degree program will be found in the appropriate paragraphs for each graduate school or department.

Academic Classifications

Those students who have a bachelor's degree from an accredited program with acceptable quality of undergraduate work are classified as regular students.

Students whose records do not qualify them for enrollment as regular students may be accepted as provisional students. Provisional students must obtain a B average in the first 12 quarter hours of credit work in order to continue in the graduate program; at that time, they may be reclassified as regular students.

Those students who are not pursuing a specific degree program are classified as special students. Special students must satisfy the requirements for admission and perform work of satisfactory level in order to continue as special students.

Any student whose record is not satisfactory may be dropped by action of the graduate school committee for his program.

Academic Requirements

A candidate for the master's degree must satisfactorily complete an approved program conforming to the requirements of the department or graduate school in which he is registered.

The requirements for the master's degree are a minimum of 40 quarter hours of correlated work of graduate caliber, together with such other study as may be required by the department or graduate school concerned.

In order to qualify for any master's degree except that of Master of Science in Professional Accounting, an average grade of B must be obtained in the necessary quarter hour credits required for the degree, excluding any transfer credits. For the degree of Master of Science in Professional Accounting, an average grade of B must be obtained in 60 quarter hour credits and no less than a C for the remainder of the work. At the discretion of the graduate school committee for each of the various degrees, not more than 9 quarter hours of extra courses or repeated courses may be allowed in order to satisfy the grade requirements for a degree. At the discretion of the graduate school committee for each of the various degrees, the committee may limit the number of C grades allowable to satisfy the grade requirements for a degree.

Within the above limitations for extra or repeated courses, a required course for which a grade of F is received must be repeated with a grade of C or better, and may be repeated once. If a grade of F is received

in an elective course, that course may be repeated once to obtain a grade of C or better, or another elective course may be substituted for it. If a grade of C is received in a required course, that course may be repeated once to obtain a grade of B or better.

Comprehensive Examination

At the discretion of the department, a final written or oral comprehensive examination may be required. Such examinations will be given at least two weeks before the commencement at which the degree is expected.

Thesis

If a thesis is required in partial fulfillment of degree requirements, it must show independent work based in part upon original material, and must meet the approval of the respective graduate school committee.

Instructions concerning preparation of the thesis may be obtained from the respective graduate school committee.

Foreign Language Requirement

An examination to show evidence of ability in one or more foreign languages may be required in some graduate programs. This knowledge is established by an examination arranged by the respective graduate school committee.

Transfer Credits

A maximum of 12 quarter hours of graduate credit obtained at another institution may be accepted toward the master's degree provided the grades are A or B. Grades on transfer credits may not be used for the purpose of obtaining the academic average necessary for completion of the degree requirements.

Time Limitations

Course credits earned in the program of graduate study, or accepted by transfer, are valid for a maximum of seven years unless an extension is granted by the respective graduate school committee.

THE DOCTOR OF PHILOSOPHY DEGREE

The Doctor of Philosophy Degree is awarded to candidates who give evidence of high attainment and research ability in their major field. The degree requirements are administered by committees in charge of each degree program. These committees may be departmental graduate committees or committees of the respective graduate schools depending upon the nature of the program. It is the responsibility of the chairman of the committee to certify to the Graduate Division Office the completion of each requirement for each candidate.

Admission

Each degree program has an established admission procedure for students starting their doctoral work at Northeastern University.

Classification and Degree Candidacy

Students taking advanced graduate work are classified as follows:

1. Doctoral Student

Students in this classification have been admitted to a doctoral program.

2. Doctoral Degree Candidate

Students in this classification are doctoral students who have completed 40 quarter hours of acceptable graduate work beyond the bachelor's degree and have passed the qualifying examination.

3. Special Students

This classification is given to students taking advanced graduate work who are not enrolled for a master's degree, and who have not been admitted to a doctoral program.

Residence Requirement

Candidates for the Doctor of Philosophy Degree must spend the equivalent of at least one academic year in residence at the University taking graduate work. The committee of each degree program specifies the method by which the residence requirement is satisfied.

Qualifying Examination

Students must pass a qualifying examination within time limits set by the committee of the degree program. The material covered in the qualifying examination and the level of course work necessary to prepare for the examination are established by the committee for each program.

Comprehensive Examination

Degree programs may require a comprehensive examination during the time in which a student is a degree candidate. The purpose of this examination is to test the knowledge and skills of the student in a particular area and his knowledge of recent research developments in his field.

Course Requirements

The minimum course requirements of 40 quarter hours constitutes the work normally required for a master's degree. The course requirements beyond this are the doctoral course requirements and the amount of such work necessary in each doctoral program is specified by the committee in charge of the doctoral program.

Dissertation

Each doctoral student must complete a dissertation which embodies the results of extended research and makes an original contribution to the field. This work should give evidence of the candidate's ability to carry out independent investigation and interpret in a logical manner the results of the research. The method of approval of the dissertation is established by the committee in charge of the degree program. The original bound copy of the dissertation must be deposited in the library.

Foreign Language

The nature of the foreign language requirement and how this requirement is satisfied is established by the committee in charge of each degree program.

Final Oral Examination

The final oral examination will be taken after completion of all other requirements for the degree. This examination must be held at least two weeks before the commencement at which the degree is to be awarded.

The committee for the final oral examination for the doctoral degree is appointed by the committee in charge of the degree program, and the Dean of the Graduate Division is notified of the time of the examination.

The final oral examination will be on the subject matter of the doctoral dissertation and significant developments in the field of the dissertation. Other fields may be included if recommended by the examining committee.

Transfer Credit

If transfer credit for doctoral course work is desired, approval for such transfer credit must be given by the committee in charge of the degree program.

Time Limitation

After the establishment of degree candidacy, a maximum of five years will be allowed for the completion of the degree requirements. If a student wishes to obtain a time extension, he may, with the approval of the committee of his degree program, petition the Committee on Doctoral Degree Programs of the University Graduate Council for such extension.

Registration

All students must register in the Graduate Division Office for course work or dissertation as approved by their advisers or the departmental registration officer. After the first registration for doctoral work, registration must be continuous unless withdrawal is allowed by the committee in charge of the degree program. Students must be registered

for dissertation during the quarter in which they take the final oral examination.

INTERDISCIPLINARY PROGRAMS

Some graduate students may wish to pursue doctoral programs whose boundaries overlap substantially into two or more departments. In such cases, an interdisciplinary program may be established which corresponds in scope and depth to doctoral standards, but does not agree exactly with the individual departmental regulations. For such possibilities, the following plan is in operation:

Admission

Application for admission to interdisciplinary doctoral study consists of the submission of a carefully thought-out written proposal describing the areas of proposed study and research. The proposal may be a part of the initial application for admission to graduate study at Northeastern University, or it may be submitted by a student already enrolled. It may be directed to a doctoral degree-granting department or to the Dean of the Graduate Division, who directs it to the appropriate department. In either case, admission to interdisciplinary doctoral study requires favorable recommendation by the sponsoring doctoral degree-granting department and approval by authorized representatives of the graduate study committees of the departments appropriate to the disciplines covered by the applicant's proposal. The sponsoring department becomes the registration base of the student.

Formation of Interdisciplinary Committee

A student who has been accepted for interdisciplinary study must obtain the consent of an adviser who will direct his doctoral thesis. This adviser, who may or may not be a member of the registration department, will be chairman of the interdisciplinary committee for this student. A second member will be appointed from the registration department by its chairman. These two members will obtain one or more additional members or request the Dean of the Graduate Division to do so. At least two departments must be represented on the committee and a majority of the committee must come from doctoral degree-granting departments. The chairman of the registration department will notify the Dean of the Graduate Division of the membership of the committee as soon as arrangements are complete.

Duties of Interdisciplinary Committee

A member of the interdisciplinary committee who is also a member of the registration department will serve as the registration officer to approve the course registration for the student. A copy of the approved course registration must also be filed with the other committee members and with the graduate study committee of the registration department.

The interdisciplinary committee will be responsible for the administration of the qualifying examination, language examination, approval of the thesis, and comprehensive examination. This committee must also certify to the registration department the completion of the requirements for the award of the doctoral degree.

The interdisciplinary committee must assure that the program of the student represents standards comparable to those of the registration department and that the program is not so broad that it has inadequate depth in any area.

The program of the student may be reviewed at any time by the Dean of the Graduate Division to determine whether objectives of the program are being met.



Degree Programs
and
Academic Information
Graduate School of Arts and Sciences

Master of Arts Degrees
in the fields of
Economics, English, History, Political Science,
Psychology, and Sociology-Anthropology

Master of Science Degrees
in the fields of
Biology, Chemistry, Health Sciences, Mathematics, and Physics

Doctor of Philosophy Degrees
in the fields of
Biology, Chemistry, Mathematics, Physics, Psychology, and Sociology

GENERAL INFORMATION

The Graduate School of Arts and Sciences issues a circular about July 1 which lists the courses for the following academic year and the times at which they meet.

The number of students enrolled in each class will be limited to permit effective teaching at the graduate level, and the University reserves the right to cancel any course.

Applications

All applicants for full-time and part-time study should address inquiries to the respective departments. Application forms and reference blanks will be mailed to the applicant. This material, together with the necessary transcript must be filed by June 1.

Applicants for part-time study who wish to be considered after this date must make an appointment to see a departmental representative. The date of such interviews will be announced in course circulars issued about July 1.

Part-time students are allowed to take a maximum of two courses unless permission for a third course is obtained from the department or the Director of the Graduate School of Arts and Sciences.

Academic Requirements

The graduate program for each department is described in this catalogue under the departmental headings. These requirements are established in accordance with the Graduate Division regulations. The Graduate School of Arts and Sciences allows nine quarter hours of credit to be taken in addition to the stated degree requirements in order to repeat failed required courses or to substitute for elective courses to obtain the required B average for completion of degree requirements.

Assistantships and Fellowships

Teaching assistantships are available in all of the departments of the Graduate School of Arts and Sciences. In addition, some of the departments have research fellowships available for students enrolled for work leading to the master's degree. Applications for fellowships must be filed by March 15, unless an earlier date is specified by a department, with two letters of recommendation and transcripts of all prior college work.

Honorary Societies

Northeastern University has chapters of the Society of the Sigma Xi and of Phi Kappa Phi. Graduate students are eligible for consideration for election to these societies in accordance with the admission requirements of each organization.

TUITION AND FEES

Tuition Charges

Tuition for full-time doctoral degree candidates is \$600 per quarter of registration.

Tuition for master's degree candidate and special students is \$40 per quarter hour of credit.

Tuition Payments

Tuition statements are mailed to students by the Bursar's Office and are payable on or before the date specified. Checks should be drawn payable to "Northeastern University."

Registration Fee

All students new to Northeastern University are charged a registration fee of \$10 at the time of their first billing.

Late Payment Fee

A late payment fee of \$5 is charged all students for failure to pay tuition on the due date unless special arrangements have been approved by the Student Accounts office.

Make-up Examination Fee

All students given permission to take a make-up of a final examination are charged a fee of \$5.

Student Center Fee

All students on the Huntington Avenue Campus are charged a fee for the services available in the Student Center as follows:

Part-time students	\$.75 each quarter
Full-time students (including cooperative students)	\$12.50 each quarter
Teaching Assistants and Research Fellows	\$6.25 each quarter

Commencement Fee

A fee of \$25 covering commencement is required by the University of all candidates for a degree. This fee is payable on or before May 1 of the year in which the student expects to graduate.

Health Services Fee

All full-time students, including those on the Cooperative Plan and teaching and tuition assistants, will pay a nonrefundable University Health Services fee of \$25 per year. This fee will cover the group Blue Cross-Blue Shield program and the medical services which are provided to students by the University Health Service.

Infirmary Fee

All students are assessed an Infirmary Fee of \$10 per quarter.

Refunds

Tuition refunds will be granted only on the basis of the date appearing on the official withdrawal form filed by the student. Nonattendance does not constitute official withdrawal. Questions regarding refunds should be discussed with the Bursar's Office.

Refunds will be granted in accordance with the following schedule:

Amount of Refund:	
Official Withdrawal Filed Within:	Percentage of Tuition
First week of Quarter	100%
Second week of Quarter	75%
Third week of Quarter	50%
Fourth week of Quarter	25%

FINANCIAL AID

Northeastern University has available fellowships and assistantships for students who are engaged in graduate work. The Graduate Division will send candidates the proper application blanks upon request.

Teaching Assistantships

Teaching assistantships are available in most of the departments giving graduate work. Holders of such assistantships carry a half-time academic load and devote half time to academic assistance in the departments. The assistantship grant includes a stipend and remission of tuition.

Tuition Fellowships

Some departments have available tuition fellowships which remit tuition for a maximum of 12 quarter hours of graduate work per quarter. In return, students will be required to assist in the academic work of the department. These fellowships are normally given to students who are in the first year of graduate work.

Research Fellowships

Research fellowships are available in some departments giving graduate work. Holders of such fellowships carry a half-time academic load and devote half time to research in the departments. The fellowship grant includes a stipend and remission of tuition.

Doctoral Research Fellowships

In the departments which give work leading to the Ph.D. degree, research fellowships are available for students who have established candidacy for the Ph.D. degree. These fellowships carry remission of tuition, and the stipend is higher than that for the research fellowships.

Appointments

Appointments to fellowships and assistantships are ordinarily announced no later than April 15 for the following academic year or summer. Appointments are for a maximum of one year and are not automatically renewed.

Full-Time Duties

Graduate students who hold teaching assistantships and research fellowships, graduate cooperative teaching assistantships, or graduate cooperative research fellowships are expected to devote full time to their studies and the duties of the grant. They may not accept outside employment without the consent of their faculty adviser and the Dean of the Graduate Division.

National Defense Student Loan Program

Under the National Defense Education Act of 1958, a long-term loan program was established to provide financial assistance to students in need of such aid to continue their education. In 1964, this act was amended to permit participation by students carrying at least one half the normal full-time academic workload as determined by the University.

The maximum amount which may be borrowed in one academic year is \$2,500. The total of loans made to a student for all years, including any loans made to him as an undergraduate, may not exceed \$10,000. The actual amount of any award will be determined by the financial position of the student and his family (if applicable) and the availability of funds. Preference is given to outstanding students.

Repayment of these loans begins nine months after the date the borrower ceases to carry, at an institution of higher education, at least one half the normal full-time academic workload as determined by that institution. The repayment period extends ten years from that point and may be further extended by periods for which he is legally entitled to deferment.

Up to 50 per cent of any such loan (plus interest) shall be canceled for services as a full-time teacher in a public or private nonprofit elementary or secondary school and in institutions of higher education at a rate of 10 per cent (plus interest) for each complete academic year of service, or its equivalent. For services in a school district determined to have a high concentration of students from low-income families or for teaching services to the physically or mentally handicapped, the cancellation rate is 15 per cent for each complete year of service, and an additional 50 per cent of any loan (plus interest) may be canceled.

Additional information and appropriate application forms are available through the Graduate Division Office or from the Office of Financial Aid. The application deadline is September 1 for full-time students or one month prior to the start of the quarter for which aid is requested in the case of half-time students.

Biology

Professors

Francis D. Crisley, B.S., M.S.,
Ph.D., Chairman
Fred A. Barkley, A.B., M.S., Ph.D.
Charles Gainor, B.S., M.S., Ph.D.
Charles M. Goolsby, B.S., M.S.,
Ph.D.
Abdul-Karim Khudairi, B.S., Ph.D.
Nathan W. Riser, B.A., M.A., Ph.D.
Director of the Marine
Science Institute

Associate Professors

Janis Z. Gabliks, D.D.S., M.S., Ph.D.
Fred A. Rosenberg, B.A., Ph.D.
Henry O. Werntz, B.S., Ph.D.

Assistant Professors

H. David Ahlberg, A.B.
M. Patricia Morse, B.S., M.S., Ph.D.
Samuel E. Moyer, B.S., M.S., Ph.D.
Joseph V. Pearincott, B.S., M.S.,
Ph.D.

THE MASTER'S DEGREE

Full-Time Program

THE MASTER OF SCIENCE IN HEALTH SCIENCE

Part-Time Evening Program

Admission

To be enrolled for graduate work in biology leading to the Master of Science or the Master of Science in Health Science degrees, applicants must have obtained a bachelor's degree from a recognized institution, with an undergraduate program normally including one year of organic chemistry, physics, and mathematics and six quarter courses or the equivalent in biological sciences beyond the elementary level. Students admitted with deficiencies should remove them during the first 20 quarter credit hours of graduate work by courses whose credit will not be counted toward the Master's requirements. Applicants for the master's programs should apply to the Departmental Graduate Committee by March 15.

Program

Forty quarter hours of academic work are required. This work must include courses of the core program: one year of botany, zoology, and physiology and one course each in genetics, microbiology, and ecology. With approval of the Graduate Committee, advanced undergraduate courses, including those taken previously at other institutions, may be

used to satisfy core requirements. Health Science students may substitute health science or environmental health for three areas of the core biology requirement. Four quarter credit hours of seminar is required for both master's degree programs. At least 20 quarter hours of credit must be taken in graduate biology courses, including the required seminars. Work may be taken from other departments as approved by the student's adviser.

During his tenure, in addition to the above course requirements, each student must enroll for the least six to twelve credits of work in 18.990, Special Topics in Biology, or 18.991, Research for the Master of Science degree. After initial election of either 18.990 or 18.991 the student must register for either of these courses for each quarter until the work is satisfactorily completed. Work in 18.990, Special Topics in Biology, is pursued under the supervision of an individual faculty member, by mutual agreement. It may take the form of a comprehensive, critical review of the literature in a specialized area and/or a specific program of experimental work on a single topic. If experimental work has been elected under 18.990 it may later be expanded, with permission of the graduate committee, into a master's thesis with a topic and adviser and a committee of three members approved by the graduate committee. Grades in 18.990 or 18.991 are recorded as "incomplete" until all work is completed, culminating in either a comprehensive, well-written report which must be reviewed by the graduate committee or a thesis. A comprehensive examination in the last six months of the master's program is required of all students, except those presenting a thesis. For the latter a final oral examination on the thesis is required. The department encourages the pursuit of a thesis wherever feasible.

The program leading to the degree Master of Science in Health Sciences is designed for part-time students who may progress according to their abilities, the time available, and the need or desire to extend their education into interdisciplinary work involving biology or allied areas such as the health sciences. With the permission of the graduate committee the two master's degree programs are interchangeable.

THE DOCTOR OF PHILOSOPHY PROGRAM

Admission

Applications should be sent to the Biology Department Graduate Committee. Applicants who will have a master's degree or its equivalent at entry may be considered for direct admission to the doctoral program. Those who will not may be considered only for admission to the master's program, and, after satisfactory completion of 30 quarter hours of graduate study, may then be considered for admission to the doctoral program.

Students enrolled at Northeastern University must submit transcripts of their undergraduate and graduate work which has been completed. Students enrolled at other institutions must submit three letters of recommendation and, except for foreign students, their Graduate Record Examination scores in addition to the necessary transcripts. Foreign students will be expected to take their Graduate Record examinations during their first year's residency. The applicant should make clear the specific area of his biological research interest. If favorable action is taken, admission will be contingent upon the satisfactory completion of the course work in progress at the school in which the applicant is enrolled.

Residence Requirement

The residence requirement after being admitted to doctoral candidacy may be satisfied by one year of full-time graduate work or by two years of half-time graduate work. However, a student should expect to spend at least two years or the equivalent in full-time study.

Degree Candidacy

Degree candidacy is established in accordance with the general Graduate Division Regulations.

Qualifying Examination

Students entering the doctoral program will be expected to have had the core program or its equivalent before taking their qualifying examination. Students who have been accepted into the doctoral program will normally be expected to complete the qualifying examination by the end of four quarters at Northeastern University at a time specified by the Departmental Graduate Committee. Five of the following fields are to be covered in the qualifying examination of each candidate: botany, zoology, physiology, biochemistry, ecology, microbiology, genetics. The examination will be oral and approximately two hours in duration. It will be announced by the Departmental Graduate Committee at least two months before the examination is given. Eligibility to continue the program toward the Doctor of Philosophy degree is contingent upon satisfactory performance on the qualifying examinations.

Comprehensive Examination

The comprehensive examination requirement will be fulfilled by two written examinations, one in the major area of specialization and the other in closely related areas. The candidate may apply through his adviser after completing one of the foreign language requirements and at least one quarter prior to the oral examination.

Course Requirements

After the establishment of candidacy, any further course requirements will be established by the thesis adviser and approved by the Graduate Committee.

Thesis

In most cases, arrangements for the thesis director will have been made before the completion of the qualifying examinations. If not, such arrangements must be made as soon as possible after degree candidacy has been established. The thesis director advises the candidate on the research for the thesis, which is to be performed in accordance with general graduate school regulations. He serves as chairman of the thesis committee, which must approve the thesis before the degree may be conferred. The doctoral committee shall consist of at least five members.

Language Requirement

Ability to read and translate biological literature in two foreign languages must be established by the candidate. In order to maximize the usefulness of these languages in his training the student should take these examinations as early as possible. The examinations will be administered by the Department of Biology, or in certain cases, by the Language Department. French, German, and Russian are the three most important foreign languages for the biologist. Students will be expected to choose two of these languages for their examinations, but another language may be substituted for one where there is a significant literature in the area of interest.

Final Oral Examination

This examination will be held in accordance with the General Regulations of the Graduate Division.

INTERDISCIPLINARY PROGRAMS

Admission

Application and credentials for admission to interdisciplinary programs involving the Biology Department, where this department is clearly the department of registry, as described under "General Regulations," should be submitted to the Biology Department as described under "Admission to the Doctor's Program." The interdisciplinary committee shall consist of at least five members. The composition of this committee shall be determined by mutual consent between the departments involved, but shall have at least three members from the Biology Department if the thesis adviser is from this department. Upon admission, suitable core interdisciplinary course requirements will be determined by the interdisciplinary committee.

Qualifying Examinations

Students accepted into the program will normally be expected to complete the qualifying examination by the end of four quarters at Northeastern University. At least five areas of study will be covered by the qualifying examination, at least three of which will be oral examinations chosen by the candidate from the following areas: biochemistry, botany,

ecology, genetics, microbiology, physiology, and zoology. The remaining components of the examination will be specified and evaluated by the other participating department. With the exceptions of the procedures for admission and examinations for qualification, the remaining requirements and procedures are as specified under "The Doctor's Program for Biology."

DESCRIPTION OF COURSES

All courses carry four quarter hours of credit unless otherwise specified.

18.801 Dynamics of Ecology

Chemical, physical and biotic factors influencing plant and animal communities. (Offered alternate years, not offered in 1968-69 — Spring Quarter)

18.802 Physiological Chemistry

Intermediary metabolism and nutrition. (Offered 1968-69, Spring Quarter)

18.803 Biometrics

Statistical methods applied to biological samples and analysis of biological research data. (Offered 1968-69, Winter Quarter)

18.804 Lower Invertebrates

Taxonomy, morphology, embryology, and life histories of acoelomate phyla. (Offered 1968-69, at Nahant, Summer Quarter)

18.805 Coelomate Invertebrates

Continuation of 18.804. (Offered 1968-69, at Nahant, Summer Quarter)

18.806 Malacology

Prep. Invertebrate Zoology
Functional morphology, embryology, systematics, and ecology of the major groups of mollusks. (Offered 1968-69, Spring Quarter)

18.807 Parasitology

Symbiotic relationships of protozoans, mesozoans, flatworms, nematodes, acanthocephalans, and arthropods. (Offered 1968-69, Winter Quarter)

18.808 Vertebrate Zoology

Prep. Comparative Anatomy or Comparative
Vertebrate Anatomy and Embryology
Evolution, phylogeny, anatomy, physiology, behavior, population dynamics, reproduction, etc., of the vertebrates. Field collection, preparation and study of local vertebrates will be carried out in the laboratory.
Credits: 5 quarter hours. (Offered 1968-69, Spring Quarter)

18.809 Mammalogy

Prep. Vertebrate Zoology or Consent
of the Instructor
Phylogeny, anatomy, physiology, behavior, population dynamics, reproduction, etc. of the animals. The lecture will include student presentation of the recent advances in Mammalogy. Field collection and laboratory preparation and study of specimens will be included.
Credits: 5 quarter hours. (Offered 1968-69, Summer Quarter)

18.810 Ichthyology

Natural history and systematics of fishes, with emphasis on marine species.
(Offered 1968-69, at Nahant, Summer Quarter)

18.817 Tissue Pathology

Microscopic analysis of pathological animal tissues. (Not offered 1968-69)

18.819 Principles of Systematics

Codes of nomenclature; biological principles basic to methodology of the preparation of monographs and of faunas and floras.
Credits: 3 quarter hours. (Alternate years, offered 1968-69, Spring Quarter)

18.820 Lower Plants

Systematic morphology and life cycles of Monera and plant-like Protista.
(Offered 1968-69, Fall Quarter)

18.821 Higher Plants

Systematic morphology of the Metaphyta. (Offered 1968-69, Winter Quarter)

18.822 Systematic Botany

Classification and nomenclature of seed plants.
(Alternate years, offered 1968-69, Spring Quarter)

18.824 Plant Anatomy

Comparative developmental anatomy of seed plants.
(Alternate years, offered 1968-69, Spring Quarter)

18.825 Plant Nutrition and Metabolism

Mineral nutrition, photosynthesis, metabolic pathways and translocation in higher plants.
(Offered 1968-69, Winter Quarter)

18.826 Plant Growth and Reproduction

Plant hormones, growth, development and physiology of reproduction in plants.
(Offered 1968-69, Fall Quarter)

18.829 Fossil Plants

Plant forms from past times.
Credits: 3 quarter hours. (Alternate years, not offered 1968-69, Spring Quarter)

18.830 Marine Algae

Systematics, life histories and ecology of marine algae, with emphasis on the flora of the Gulf of Maine. (Offered 1968-69, at Nahant, Summer Quarter)

18.835 Mammalian Physiology

Structural and biochemical aspects of mammalian cells. Bioelectric phenomena. Muscle and nerve function. Physiology of digestive, cardiovascular and respiratory systems. Kidney and its functions. Reproductive physiology and endocrine system.
(Offered 1968-69, Spring Quarter)

18.840 Comparative Physiology of Regulatory Mechanisms

Prep. Basic Physiology
Principles and selected examples of physiological response to environmental variation.
Credits: 2 quarter hours. (Offered 1968-69, Spring Quarter)

18.842 Vertebrate Endocrinology

Regulation of physiologic processes in vertebrates by hormones and related substances.

Credits: 2 quarter hours.

(Offered 1968-69, Winter Quarter)

18.843 Procedures in Endocrinology

Credits: 3 quarter hours.

(Offered 1968-69, Spring Quarter)

18.850 Population Genetics

Prep. Basic Genetics

Mendel's laws and principles of genotype dynamics in populations of organisms. Mechanisms of evolution. (Alternate years, not given 1968-69, Winter Quarter)

18.855 Insect Metabolism

Food consumption and intermediary metabolism in insects.

Credits: 2 quarter hours.

(Offered 1968-69, Winter Quarter)

18.860 Cell Biophysics and Biochemistry I

Prep. Organic Chemistry

General Biology

Biogenesis and ultrastructure of the cell considered together with the biophysical procedures and biochemical patterns used in the study of cellular and tissue components.

Credits: 5 quarter hours.

(Offered 1968-69, Fall and Winter Quarters)

18.861 Cell Biophysics and Biochemistry II

Prep. 18.860

A continuation of 18.860.

Credits: 5 quarter hours.

(Offered 1968-69, Spring Quarter)

18.862 Comparative Invertebrate Physiology

Prep. Invertebrate Zoology

The physiology of nutrition, digestion, circulation, movement, osmoregulation of the invertebrates.

Credits: 5 quarter hours.

(Offered 1968-69, Fall and Winter Quarters)

18.863 Electrophysiology

Prep. 18.860 or equivalent

The physiology of muscle, heart, nerve and sensory receptors.

(Offered 1968-69, Spring Quarter)

18.870 Tropical Field Studies

Field work under direct supervision of faculty. 1 Q.H. Credit for each week of work.

(Given as opportunity permits, offered 1968-69, Summer Quarter)

18.901 Serology — Immunology

Prep. Basic Microbiology

Current concepts concerning specific and non-specific factors of resistance to microbial disease. Chemical and biological considerations of antigens and antibodies. Laboratory work includes agglutination, precipitin and agar diffusion tests. Quantitative approaches stressed.

Credits: 5 quarter hours.

(Offered 1968-69, Spring Quarter)

18.903 Environmental Microbiology

Prep. Basic Microbiology

The microbial environment and ecology of the cell. Interactions between microbial populations, stressing soil and fresh-water associations.

(Offered 1968-69, Fall Quarter)

18.904 Medical Microbiology

Prep. Basic Microbiology

The bacterial cell as a pathogen, stressing major genera of disease-producing organisms and factors influencing virulence. (Offered 1968-69, Winter Quarter)

18.905 Marine Microbiology

Morphological, physiological and ecological factors concerning marine microorganisms. Taxonomic problems, microbial association and general methodological approaches to the study of marine microorganisms.

(Offered 1968-69, Spring Quarter)

18.907 Food Microbiology

Prep. 18.120, Organic Chemistry

Microbiology of food with emphasis on the pathogenic types and their interactions with other groups indigenous to food.

Credits: 2 quarter hours.

(Offered 1968-69, Spring Quarter)

18.908 Food Microbiology Laboratory

Prep. 18.907 as a prerequisite or co-requisite

Detection, quantification and isolation of microorganisms and their products of significance in food with emphasis on the pathogenic types.

Credits: 2 quarter hours.

(Offered 1968-69, Spring Quarter)

18.909 Animal Virology

Prep. 18.120, Biochemistry

Physical and chemical properties of viruses. Viruses as intracellular parasites. Viral replication and genetics, host-virus interaction, pathogenesis, diseases, tumor viruses and serological reactions. Laboratory sessions will consist of demonstrations emphasizing use of animals, eggs and animal cell cultures for cultivation, isolation and identification of viruses.

(Offered 1968-69, Spring Quarter)

18.980 Seminar

Various topics and newer developments in botany, microbiology, physiology and zoology covered in depth. Student presentations are emphasized.

Credits: 1 quarter hour.

(Offered yearly every quarter)

18.990 Special Topics in Biology

Prep. Biology core requirement and admission to the graduate program.

Special study of a selected topic under direction of a faculty member. Topic, direction of study and number of credits per quarter to be arranged with the faculty member supervising the study.

(Offered yearly every quarter)

18.991 Research and Thesis for Master of Science Degree

Prep. M.S. candidacy

Research methods of some special field and their application to a specific problem, under direction of a faculty member.

Credits: To be arranged with thesis director.

(Offered yearly every quarter)

18.995 Research and Thesis for Doctor of Science Degree

Prep. Ph.D. candidacy

Original research in depth, representing a significant contribution of new biological knowledge, and a written thesis thereon, under the supervision of a faculty member.

(Offered yearly every quarter)

Chemistry

Professors

Robert A. Shepard, B.S., Ph.D.,
Chairman
Karl H. Weiss, B.S., Ph.D.

Associate Professors

William E. Cass, Ph.B., Ph.D.
Michael J. Eitel, B.S., Ph.D.
William F. Holton, B.S., M.S., Ph.D.
David M. Howell, B.S., M.S., Ph.D.
Conrad M. Jankowski, B.S., M.S.,
Ph.D.
Elmer E. Jones, Ph.B., B.S., Ph.D.

Barry L. Karger, B.S., Ph.D.
Harold Naidus, B.A., M.S., Ph.D.
John L. Roebber, B.A., Ph.D.
Robert L. Stern, B.A., M.A., Ph.D.
Alfred Viola, B.A., M.A., Ph.D.
Robert N. Wiener, B.A., M.S., Ph.D.

Assistant Professors

Darryl D. DesMarteau, B.S., Ph.D.
Joseph D. Gresser, B.S., Ph.D.

Lecturers

Albert H. Soloway, B.S., Ph.D.

Admission

To be enrolled for graduate work in chemistry as a regular student, a student must have a bachelor's degree from a recognized institution and must have satisfactorily completed a curriculum of not less than four full-year chemistry courses of the level required of an undergraduate major in chemistry. These must include organic, physical, and analytical chemistry. Admission policy favors those who have taken more chemistry than these minima. In addition, one year each of college physics and calculus are required, and further work in these subjects is desirable.

For the full-time program, these admission requirements may be modified to accommodate applicants who have taken fewer courses than indicated above, but who have outstanding records and a strong interest in chemical or interdisciplinary research. See also the description of Interdisciplinary Programs.

THE MASTER'S DEGREE

Full-Time Program

The normal full-time program consists of courses, seminars, research, and a thesis thereon. Each student is required to take 12.801, Introduction to Research I, and 12.802, Introduction to Research II, and at least two courses, four quarter hours of credit, in each of the four major fields of Analytical, Inorganic, Organic, and Physical Chemistry. No more than

12 credit hours may be assigned to 12.991, Research and Thesis for the Master of Science degree, and no more than four credit hours to 12.990, Seminar. Each student is required to attend 12.990, Seminar, in each term. One credit is assigned to a student for each term in which he conducts a seminar, up to the maximum of four credits.

Part-Time Evening Program

The admission requirements for this program are the same as for the full-time program, but course requirements differ, and students may progress according to their abilities and the time available.

The following are required courses in the part-time program:

		Credits
12.821	Analytical Separations	2
12.822	Electroanalytical Chemistry	2
12.823	Optical Methods of Analysis	2
12.841-843	Advanced Inorganic Chemistry	6
12.861-862	Advanced Organic Chemistry	4
12.863	Theoretical Organic Chemistry	2
12.881-882	Thermodynamics	4
12.885-886	Atomic and Molecular Structure	4
		<hr/> 26

Electives

Six additional credits must be taken in graduate chemistry courses. The remaining eight credits may be taken in any graduate courses in mathematics, engineering, or science for which the student has the necessary preparation.

THE DOCTOR OF PHILOSOPHY DEGREE

The doctoral program in chemistry is a logical extension of the master's program, but it may be pursued only in residence. The additional requirements beyond those of the master's degree are designed to demonstrate superior proficiency in original research, including technical reading ability in two foreign languages and familiarity with current advances in one of the main divisions of chemistry. Any student who wishes to pursue the doctorate must petition the Department for acceptance in the doctoral program. If accepted, a student is considered to be in the doctoral program as soon as he begins taking the doctoral qualifying examination and takes up full-time residence.

Residence Requirement

The residence requirement is satisfied after one year of full-time graduate work or two years of half-time work; however, it should be expected that at least two years of full-time work after establishment of degree candidacy will be necessary to complete the doctoral degree requirements. If a student holds a teaching assistantship which occupies one

half of his time, his residence requirement is being discharged at half rate. No other part-time arrangements are permitted. If a candidate has a research fellowship which supports his research for the doctoral thesis, his residence requirement is discharged at a full rate.

Degree Candidacy

Degree candidacy is established in accordance with the general Graduate Division regulations.

Qualifying Examination

The qualifying examination consists of four parts, offered separately, covering the fields of analytical, inorganic, organic and physical chemistry. These examinations are scheduled in early September, in mid-winter, and in late June. Passing the series requires: (a) a passing grade, C or better, in each field; (b) a B average or better for all four fields; (c) a B or better in the student's field of specialization; and (d) completion of the series within 18 months of beginning full-time graduate study (i.e. within the first 4 consecutive offerings of the examinations). The examination in any one field may be repeated only once.

A person not in the full-time graduate program may petition the department for permission to take the qualifying examinations. If permission is granted, such a person must complete the examinations within a period of 13 months (i.e. within 4 consecutive offerings of the examinations). If he does so successfully, he must apply immediately for admission to full-time doctoral study within the next 12 months.

Comprehensive Examination

The comprehensive examination requirement is composed of a series of short written examinations in the candidate's field of specialization. These are offered monthly and are designed to test the candidate's familiarity with the current research frontiers of his specialty.

Within two years after degree candidacy has been established, a student must have passed seven of these examinations before he fails seven.

Course Requirements

A candidate is normally required by his faculty adviser to do some course work beyond the 40 quarter hour minimum. The number and nature of these courses are individually determined for each candidate.

Thesis

In most cases, arrangements for a thesis adviser will have been made before the completion of the qualifying examinations. If not, such arrangements must be made as soon as possible after degree candidacy has been established. The thesis adviser directs the research for the thesis and serves as chairman of the thesis committee, which must approve the thesis before the degree may be conferred.

Language Requirement

Proficiency must be demonstrated in two foreign languages as specified by the departmental graduate committee in accordance with the general Graduate Division regulations. French, German, and Russian are the acceptable foreign languages. Normally, proficiency is demonstrated by taking examinations administered by the Chemistry Department.

Final Oral Examination

This examination will be held in accordance with the Graduate Division regulations.

DESCRIPTION OF COURSES

All courses carry two quarter hours of credit except seminar and research.

12.801 Introduction to Research I Prep. Admission to the Graduate Program in Chemistry

A demonstration and laboratory course to introduce the student to general research techniques. Problems will be assigned in glassblowing, chemical literature, and instrumental measurements. Laboratory projects directed by the graduate faculty are included. (Offered yearly, Fall Quarter)

12.802 Introduction to Research II Prep. 12.801, Introduction to Research I

Laboratory projects are assigned, which are directed by the members of the graduate faculty, and which demonstrate and utilize the specialized research techniques in the student's major area of interest.

(Offered yearly, Winter Quarter)

12.821 Analytical Separations Prep. Admission to the Graduate Program in Chemistry

The theory and practice of analytical separation techniques. Topics will include distillation, liquid-liquid extraction, various types of chromatography, and other techniques. (Offered yearly, Fall Quarter)

12.822 Electroanalytical Chemistry Prep. Admission to the Graduate Program in Chemistry

The principles and practice of electrometric methods of analysis. Topics of discussion will include: electrogravimetry, coulometry, polarography, chronopotentiometry, and pH measurements. An extensive discussion of titration end-point detection systems will include: potentiometric, conductometric, amperometric and high frequency methods. (Offered yearly, Winter Quarter)

12.823 Optical Methods of Analysis Prep. Admission to the Graduate Program in Chemistry

The theory and practice of traditional and recent optical methods of analysis. Topics will include infrared, ultraviolet and visible analytical spectroscopy as well as such techniques as flame emission and atomic absorption spectroscopy. Nuclear magnetic resonance, electron spin resonance, and mass spectroscopy will also be discussed. (Offered yearly, Spring Quarter)

12.824 Special Topics in Analytical Chemistry I Prep. Admission to the Graduate Program in Chemistry
 Selected topics of current importance in analytical chemistry.
 (Offered yearly, Fall Quarter)

12.825 Special Topics in Analytical Chemistry II Prep. Admission to the Graduate Program in Chemistry
 Selected topics of current importance in analytical chemistry.
 (Offered yearly, Winter Quarter)

12.826 Special Topics in Analytical Chemistry III Prep. Admission to the Graduate Program in Chemistry
 Selected topics of current importance in analytical chemistry.
 (Offered yearly, Spring Quarter)

12.841 Advanced Inorganic Chemistry I Prep. One Year Physical Chemistry
 Characteristics of atoms and molecules based on their electronic structure and the periodic classification of elements. Structure of crystals. Electrostatic complexes. Advanced chemistry of lighter elements.
 (Offered yearly, Fall Quarter — day and evening,
 Winter Quarter — day only)

12.842 Advanced Inorganic Chemistry II Prep. 12.841, Advanced Inorganic Chemistry I
 Advanced treatment of the chemistry of transition metals; acid and base behavior. The significance of nuclear properties, nuclear changes and tracer studies in inorganic chemistry is an integral part of the course.
 (Offered yearly, Winter Quarter — evening only,
 Spring Quarter — day only)

12.843 Advanced Inorganic Chemistry III Prep. 12.842, Advanced Inorganic Chemistry II
 Equilibrium properties of complex ions. Elementary inorganic reaction stereochemistry. Crystal symmetry properties. The solid state from a chemical point of view. Semiconductors, metals, alloys, non-stoichiometric compounds. Chemistry of the heavier non-transition elements. Lanthanides and actinides.
 (Offered yearly, Spring Quarter — evening)

12.844 Radiochemistry I Prep. Admission to the Graduate Program in Chemistry
 Nuclear reactions, the interaction of matter with high-energy radiation, detection of radiation and the statistics of radioactive counting. An introduction to the use of radioactive tracers in chemical research.
 (Offered 1969–70, Fall Quarter)

12.845 Radiochemistry II Prep. 12.844, Radiochemistry I
 A continuation of 12.844. (Offered 1969–70, Winter Quarter)

12.846 Coordination Chemistry Prep. 12.843, Advanced Inorganic Chemistry III
 Coordination compounds: their experimental detection, calculation of stability constants, factors affecting solubility and stability constants. Ligand field

theory. Acidity, color, and lability of complexes, Kinetic and stereochemical studies of inorganic reaction mechanisms. (Offered 1968-69, Spring Quarter)

12.847 Special Topics in Inorganic Chemistry Prep. 12.842, Advanced Inorganic Chemistry II and Consent of Instructor

Selected topics of current importance in inorganic chemistry such as non-stoichiometric compounds, geochemistry, fused salt chemistry, ion exchange resins, chemistry of transition elements. (Offered 1968-69, Fall Quarter)

12.861 Advanced Organic Chemistry I Prep. One Year of Organic Chemistry
An intensive survey of organic reactions. Modern concepts of structure and mechanism are used to correlate factual material. (Offered yearly, Fall Quarter)

12.862 Advanced Organic Chemistry II Prep. 12.862, Advanced Organic Chemistry I
A continuation of 12.861. (Offered yearly, Winter Quarter)

12.863 Theoretical Organic Chemistry Prep. 12.862, Advanced Organic Chemistry II
Inductive, resonance and steric effects on reactivity and properties of organic molecules. Theory of organic acids and bases. Introduction to the study of organic reaction mechanisms. (Offered yearly, Spring Quarter)

12.864 Stereochemistry I Prep. 12.862, Advanced Organic Chemistry II
Geometrical and optical isomerism in organic compounds; conformational analysis. (Offered 1968-69, Fall Quarter)

12.865 Stereochemistry II Prep. 12.864, Stereochemistry I
Continuation of 12.864. (Offered 1968-69, Winter Quarter)

12.867 Natural Products I Prep. 12.862, Advanced Organic Chemistry II
Isolation, structure determination, synthesis and transformations of selected classes of organic compounds of biological interest. Lipids, carbohydrates, amino acids and proteins. (Offered 1968-69, Fall Quarter)

12.868 Natural Products II Prep. 12.867, Natural Products I
Continuation of 12.867. Glycosides, antibiotics, vitamins, alkaloids. (Offered 1968-69, Winter Quarter)

12.869 Natural Products III Prep. 12.868, Natural Products II
Continuation of 12.868. Steroids. (Offered 1968-69, Spring Quarter)

12.871 Special Topics in Organic Chemistry I Prep. 12.862, Advanced Organic Chemistry II and Consent of Instructor
Selected topics of current importance in organic chemistry. (Offered 1969-70, Fall Quarter)

12.872 Special Topics in Organic Chemistry II Prep. 12.862, Advanced Organic Chemistry II and Consent of Instructor
Selected topics of current importance in organic chemistry. (Offered 1968-69, Winter Quarter)

- 12.873 Special Topics in Organic Chemistry III** Prep. 12,862, Advanced Organic Chemistry II and Consent of Instructor

Selected topics of current importance in organic chemistry.
(Offered 1969-70, Spring Quarter)

- 12.876 Mechanisms of Organic Reactions I** Prep. Theoretical Organic Chemistry and 12.865, Stereochemistry II
- Consideration of the fundamental factors influencing the course of a chemical reaction. Study of the effects of structural and environmental changes on mechanisms of organic reactions.
(Offered 1968-69, Spring Quarter)

- 12.877 Mechanisms of Organic Reactions II** Prep. 12.876, Mechanisms of Organic Reactions I
- Continuation of 12.876.
(Offered 1969-70, Fall Quarter)

- 12.878 Physical Techniques of Organic Chemistry I** Prep. 12.862, Advanced Organic Chemistry II
- Correlation of structures of organic compounds with their physical properties: gross physical properties, dipole moments, absorption and Raman spectra, electron and X-ray diffraction, nuclear magnetic resonance, optical rotatory dispersion, mass spectrometry.
(Offered 1968-69, Fall Quarter)

- 12.879 Physical Techniques of Organic Chemistry II** Prep. 12.878, Physical Techniques of Organic Chemistry I
- Continuation of 12.878.
(Offered 1968-69, Winter Quarter)

- 12.881 Thermodynamics I** Prep. One Year of Physical Chemistry
- First Law of Thermodynamics, Thermochemistry, Second and Third Laws, Equilibrium.
(Offered yearly, Fall Quarter)

- 12.882 Thermodynamics II** Prep. 12.881, Thermodynamics I
- Partial Molar Properties, Mixtures, E.M.F.
(Offered yearly, Winter Quarter)

- 12.885 Atomic and Molecular Structure I** Prep. One Year of Physical Chemistry
- Introduction to Wave Mechanics, Atomic Structure, Spectroscopy.
(Offered yearly, Winter Quarter)

- 12.886 Atomic and Molecular Structure II** Prep. 12.885, Atomic and Molecular Structure I
- The Chemical Bond, diatomic molecules, polyatomic molecules.
(Offered yearly, Spring Quarter)

- 12.888 Colloid Chemistry I** Prep. One Year of Physical Chemistry
- An introduction to the physical chemistry of surfaces and of colloidal systems. Among the topics to be discussed will be colligative properties of colloidal systems, statistical equilibrium, sedimentation, diffusion, and absorption.
(Offered 1969-70, Winter Quarter)

- 12.889 Colloid Chemistry II** Prep. 12.888, Colloid Chemistry I
Continuation of 12.888, considering the theory of light scattering, the rheology of colloidal systems, chromatographic methods, and electrokinetic phenomena.
(Offered 1969–70, Spring Quarter)
- 12.891 Special Topics in Physical Chemistry** Prep. Consent of Instructor
Selected topics of current importance in physical chemistry.
(Offered 1968–69, Fall Quarter)
- 12.893 Kinetics and Statistical Thermodynamics I** Prep. 12.882, Thermodynamics II and 12.885, Atomic and Molecular Structure I
Maxwell-Boltzmann statistics, quantum statistics, partition functions, and thermodynamic properties. Experimental aspects of reaction kinetics.
(Offered yearly, Spring Quarter)
- 12.894 Kinetics and Statistical Thermodynamics II** Prep. 12.893, Kinetics and Statistical Thermodynamics I
Collision and transition state theories of reaction rates. Application of statistical thermodynamics. Reaction velocity in solution. Catalysis, chain reaction, isotope effects, and photochemistry.
(Offered yearly, Fall Quarter)
- 12.895 Statistical Mechanics I** Prep. 12.894, Kinetics and Statistical Thermodynamics II
Distribution functions. Ensembles. Entropy. Quantum generalization. Perfect gases with internal degrees of freedom.
(Offered 1968–69, Winter Quarter)
- 12.896 Statistical Mechanics II** Prep. 12.895, Statistical Mechanics I
Quantum perfect gases. Fermi-Dirac and Bose-Einstein Statistics. Some simple solids. Application to liquids and solutions. (Offered 1968–69, Spring Quarter)
- 12.897 Quantum Chemistry I** Prep. 12.886, Atomic and Molecular Structure II
Classical mechanics. Formulation of quantum mechanics. The quantum mechanics of some simple systems. The hydrogen atom. Approximate methods.
(Offered 1969–70, Fall Quarter)
- 12.898 Quantum Chemistry II** Prep. 12.897, Quantum Chemistry I
Atomic structure. Group theory. Electronic states of diatomic molecules.
(Offered 1969–70, Winter Quarter)
- 12.899 Quantum Chemistry III** Prep. 12.898, Quantum Chemistry II
Polyatomic molecules. Full rotation group and angular momentum. Atoms and molecules treated by group theory.
(Offered 1969–70, Spring Quarter)
- 12.901 Polymer Chemistry I** Prep. One year of organic chemistry and one year of physical chemistry
Basic principles of polymer chemistry. Description and classification of high polymers. Addition and condensation polymerization. Copolymerization.
(Offered yearly, Fall Quarter)
- 12.902 Polymer Chemistry II** Prep. 12.901, Polymer Chemistry I
Introduction to the study of polymer structure and its significance. Polymer

degradation. Introduction to the use of polymers in industrial applications.

(Offered yearly, Winter Quarter)

12.903 Polymer Chemistry III

Prep. 12.902, Polymer Chemistry II

The principles and modern practices in polymer usage. Coatings. Pigmentation. Plasticization. Reinforced Plastics. Inorganic Polymers.

(Offered yearly, Spring Quarter)

12.921 Biochemistry I

Prep. 12.862, Advanced Organic

Chemistry II and one year of physical chemistry

Consideration of protein chemistry including structure, acid-base equilibria, protein interactions, and proteins as enzymes. Equilibria and free energy of biochemical systems. Enzyme kinetics.

(Offered yearly, Fall Quarter)

12.922 Biochemistry II

Prep. 12.921, Biochemistry I

Biological oxidation-reduction. Intermediary metabolism.

(Offered yearly, Winter Quarter)

12.923 Biochemistry III

Prep. 12.922, Biochemistry II

A continuation of intermediary metabolism.

(Offered yearly, Spring Quarter)

12.990 Seminar (1 credit)

Prep. Admission to the Graduate
Program in Chemistry

Oral reports by the participants on current or recent investigations in chemistry.

(Offered yearly, Fall, Winter, and Spring Quarters)

12.991 Research and Thesis for M.S.

Prep. 12.802, Introduction to
Research II

Original research and a written thesis thereon, under supervision of a faculty member.

(Offered yearly, every quarter)

12.995 Research and Thesis for Ph.D.

Prep. Ph.D. Candidacy

Original research in depth, representing a significant contribution of new chemical knowledge, and a written thesis thereon, under the supervision of a faculty member.

(Offered yearly, every quarter)

Economics

Professors

Irwin L. Herrnstadt, Ph. D.
Morris A. Horowitz, Ph.D.
Wilfred S. Lake, Ph.D.
Donald Shelby, Ph.D.

Ernest M. DeCicco, Ph.D.
Harold M. Goldstein, Ph.D.
Ivory L. Lyons, Ph.D.
Gustav Schachter, Ph.D.

Associate Professors

Conrad P. Caligaris, Ph.D.

Assistant Professors

James W. Meehan, Ph.D.
Peter V. Mini, Ph.D.

Admission

To be enrolled for graduate work in economics, applicants must have obtained a bachelor's degree from a recognized institution with an undergraduate program which included a minimum of 18 semester hours of economics, or the equivalent, of which three semester hours, or the equivalent, must be statistics. The Graduate Record Examination in Economics is recommended but it is not required for admission.

THE MASTER'S DEGREE

Forty quarter hour credits of academic work are required. This program comprises 16 quarter hours of required work and 24 quarter hours of electives of which a minimum of nine quarter hours must be selected from one of the economic fields listed below. The required courses must be completed as soon as possible. With the approval of the graduate adviser, a maximum of six quarter hours may be elected from graduate courses offered by other departments as well as one advanced undergraduate course in economics carrying three quarter hours of graduate credit.

Comprehensive Examination

A comprehensive examination which will be held in accordance with the general Graduate Division regulations must be taken by all students who do not offer a master's thesis.

Master's Thesis

A master's thesis for nine quarter hours of credit is optional with the approval of the graduate adviser.

Required Courses

The required courses are:

	Credits
39.901 Microeconomic Theory	4
39.900 Microeconomic Theory	4
39.907 Mathematics for Economists*	4
39.908 Statistical Inference	4

Economic Fields

Available economic fields are listed below. Under each field are stated the required field courses and the elective field courses. Students must take at least nine quarter hours in one field of concentration. In all fields except Dynamic Aggregate Economics, the first listed required course in the field ordinarily should be taken first by the student majoring in that field. For students not majoring in the field, courses in the field may be taken in any sequence.

Manpower Economics

Required field courses:

- 39.928 Economics of the Labor Market
- 39.931 Seminar in Human Resources Development

Elective field courses:

- 39.929 Labor and Industrial Relations
- 39.930 Economics of Manpower Planning

Development Economics

Required field courses:

- 39.934 Economics of Underdeveloped Areas
- 39.935 Public Policies and Economic Planning in Underdeveloped Areas

Elective field courses:

- 39.915 Economics of Growth
- 39.930 Economics of Manpower Planning
- 39.936 Comparative Economic Systems
- 39.940 International Trade.

Monetary Economics

Required field courses:

- 39.924 Monetary Theory
- 39.925 Theory of Monetary Policy

*On approval of the graduate adviser, an elective may be substituted for this required course if the student can provide evidence of the necessary degree of mathematical competence.

Elective field courses:

- | | |
|--------|-------------------------------|
| 39.914 | Economic Fluctuations |
| 39.921 | Fiscal Policy |
| 39.926 | Problems in Money and Banking |

Quantitative Economics

Required field courses:

- | | |
|--------|------------------------------|
| 39.910 | Mathematical Economics |
| 39.911 | Research Methods |
| 39.912 | Introduction to Econometrics |

International Economics

Required field courses:

- | | |
|--------|----------------------------|
| 39.940 | International Trade Theory |
| 39.941 | International Economics |

Elective field courses:

- | | |
|--------|----------------------|
| 39.934 | Economic Development |
| 39.924 | Monetary Theory |

Dynamic Aggregate Economics

Required field courses:

- | | |
|--------|-----------------------|
| 39.914 | Economic Fluctuations |
| 39.915 | Economics of Growth |

Elective field courses:

- | | |
|--------|---------------------------|
| 39.924 | Monetary Theory |
| 39.921 | Fiscal Policy |
| 39.925 | Theory of Monetary Policy |

Public Finance

Required field courses:

- | | |
|--------|----------------|
| 39.919 | Public Finance |
| 39.921 | Fiscal Policy |

Elective field courses:

- | | |
|--------|-------------------------------|
| 39.924 | Monetary Theory |
| 39.925 | The Theory of Monetary Policy |

Industrial Organization

Required field courses:

- | | |
|--------|---|
| 39.950 | Industrial Organization |
| 39.951 | Industrial Organization and Public Policy |

Elective field courses:

39.912	Introduction to Econometrics
39.928	Economics of Labor Market
39.902	Advanced Theory

DESCRIPTION OF COURSES

All courses carry three quarter hours of credit unless otherwise specified.

39.900 Microeconomic Theory

Prep. Admission to

the Graduate Program in Economics

Meaning of economic theory and models. Costs and production functions. Utility functions and demand. Market structures and equilibrium of firm. Factor Pricing (Offered yearly, Fall and Winter Quarters)

39.901 Macroeconomic Theory

Prep. Admission to

the Graduate Program in Economics

Analysis of aggregate economic relationships in the context of Classical and Keynesian theories. Fiscal and monetary policy implications are studied. (Offered yearly, Fall and Winter Quarters)

39.902 Advanced Theory

Selected topics such as distribution theory, general equilibrium, welfare economics. (Offered yearly, Spring Quarter. Not offered, 1968-69)

39.907 Mathematics for Economists

Prep. Admission to

the Graduate Program in Economics

Differential and Integral Calculus and its relationship to economic and statistical models. Applications include marginal analysis, minimizing with respect to time series and correlation models, and probability density functions.

(Offered yearly, Fall Quarter)

39.908 Statistical Inference

Estimation of population values and testing hypotheses. Classical estimation and testing compared to Bayesian Probability. Topics covered include the normal, t , binominal, poisson, hypergeometric, exponential, X^2 , F and other probability distributions and the design of sample surveys.

(Offered yearly, Winter Quarter)

39.910 Mathematical Economics

The cobweb and other simple dynamic models. The multiplier, the acceleration principle. Mathematical analysis: complex numbers, linear difference and differential equations. Trade cycle theory, general economic equilibrium, inter-industry relations, programming, activity analysis and elementary theory of games. (Offered yearly, Winter Quarter)

39.911 Research Methods

Mathematical programming with emphasis on linear programming, including the transportation and simplex problems, and simulation and queueing theory with applications to the 1620 computer. (Offered yearly, Spring Quarter)

39.912 Introduction to Econometrics

Estimation of demand, supply, cost and production functions; applications of multivariate analysis to economic data; identification; determination of trend, oscillation and periodic movements; autocorrelation and correlogram analysis; trends in multiple regression. (Offered yearly, Spring Quarter)

39.914 Economic Fluctuations

A theoretical and empirical analysis of the causes and consequences of fluctuations in economic activity. Critical survey of current theories of economic fluctuations, with applications to postwar fluctuations in United States. (Offered yearly, Fall Quarter)

39.915 Economics of Growth

A study of economic growth of developed capitalist economies with special reference to United States. Inquiry into the growth record, causes of growth, growth models, and growth policies. (Offered yearly, Winter Quarter)

39.919 Public Finance

A survey of governmental expenditure, revenue, and debt systems, with emphasis upon their economic effects and their relationships to principles of economic welfare. It will include discussions on taxation, tax incidence, tax theory, debt management and employment levels. (Offered yearly, Winter Quarter)

39.920 State and Local Public Finance

Principles and problems of public taxation, grants-in-aid, expenditures, etc., applied to state and local governments. (Offered yearly, Spring Quarter. Not offered, 1968-69)

39.921 Fiscal Policy

A study of deliberate adjustments in revenues and expenditures for the purpose of obtaining greater economic stability and economic growth. It will include discussion on neutral fiscal policy, built-in stabilizers, budget management, attainment of full employment, inflation and deflation. (Offered yearly, Spring Quarter)

39.924 Monetary Theory

A study of money and money flows; an analysis of the quantity theory of money, velocity, and the role of financial intermediaries. (Offered yearly, Fall Quarter)

39.925 The Theory of Monetary Policy

A study of financial markets and of monetary policy objectives and instruments; an analysis of the incidence and effectiveness of monetary policy and debt management. (Offered yearly, Winter Quarter)

39.926 Problems in Money and Banking

Study of the structure, operations, and development of commercial banking and of the Federal Reserve System. Emphasis upon recent issues, problems, and proposals. (Offered yearly, Spring Quarter)

39.928 Economics of the Labor Market

Analysis of the labor market and effects on occupational and industrial structure. Topics include labor supply and allocation, wage and employment determination, level and composition of employment and unemployment, income distribution. (Offered yearly, Fall Quarter)

39.929 Labor and Industrial Relations

Analysis of institutional factors such as trade unions and collective bargaining, and their impact upon the labor market and the use of the labor force. (Offered yearly, Winter Quarter)

39.930 Economics of Manpower Planning

Various methods of manpower planning. Analysis of experiences in different countries. Role of education and training. (Offered yearly, Winter Quarter)

39.931 Seminar in Human Resources Development

Selected problems in the development of human resources. (Offered yearly, Spring Quarter)

39.934 Economics of Underdeveloped Areas

A study of the prospects of economic growth in less developed areas. Measurement and theories of economic development. Role of human and natural resources, education, technology, capital formation, etc., in national, regional and sectoral development. Changes in institutions. (Offered yearly, Fall Quarter)

39.935 Public Policies and Economic Planning in Underdeveloped Areas

Role of public sector in economic development. Public and private sectors. Planning at the national, regional, project and plant level, cost-benefit and input-output analysis. (Offered yearly, Winter Quarter)

39.936 Comparative Economic Systems

Comparative economic organization and performance of differing social systems, as exemplified by USSR, Yugoslavia, Western Europe and China. (Offered yearly, Spring Quarter)

39.937 The Soviet Economy

A historical and analytical investigation of the principles, structure and performance of the Soviet economy, with special emphasis upon theory and practice of planning. (Offered yearly, Fall Quarter. Not offered, 1968-69)

39.940 International Trade Theory

Classical, neo-classical and modern theories of international trade; gains from trade; disturbances and adjustments of balance of payments. (Offered yearly, Winter Quarter)

39.941 International Economics

International payment systems and equilibrating mechanisms; capital movements and transfers; international financial and commercial policies and institutions; regional trade arrangements. (Offered yearly, Spring Quarter)

39.950 Industrial Organization

The theoretical framework for analyses and evaluation of the static performance of real markets. An examination of empirical studies testing the usefulness of applying theory to real markets. (Offered yearly, Winter Quarter)

39.951 Industrial Organization and Public Policy

An analysis of some of the dynamic aspects of performance with reference to an appropriate theoretical framework. An examination of antitrust as a public policy designed to promote better market performance.

(Offered yearly, Spring Quarter)

39.955 Regional Economics

The processes, problems and policies involved in regional economics. Topics include analytical methods, regional models, location theory, trends, evaluation of alternative criteria for regional development.

(Offered yearly, Winter Quarter. Not offered, 1968-69)

39.956 Economics of Urban Affairs

Theories of urban development, hierarchies and typologies, land-use, commuting and trade patterns, metropolitan structures, selected urban problems for detailed study.

(Offered yearly, Spring Quarter. Not offered, 1968-69)

39.957 Economics of Health and Welfare

Theoretical basis, historical development and institutional framework of problems involved in medical economics, income supplements and security, and poverty, and a study of corrective policies.

(Offered yearly, Fall Quarter. Not offered 1968-69)

39.960 History of Economic Thought

The evolution of economic observation, inquiry, analysis and policy. The emergence and refinement of Mercantilism and its antithesis, economic liberalism, the Physiocratic and Classical schools. Contributions of the Historical and Marginalist schools. The Neo-Classical synthesis. Criticism of economic orthodoxy, Socialist and Marxian thought. The Keynesian Revolution.

(Offered yearly, Spring Quarter)

39.990 Readings in Economics

Prep. Consent of the Department

Supervised readings in selected topics in economics.

Credits: 1 quarter hour.

(Offered yearly, every Quarter)

39.991 Thesis Seminar

Thesis supervision by members of Department.

Credits: 9 quarter hours.

English

Professors

James T. Barrs, B.A., M.A., Ph.D.
Eugene J. Blackman, B.A., M.A.
Victor E. Howes, B.A., M.A., Ph.D.
Samuel French Morse, A.B., A.M.,
Ph.D.

John Kazantzi, A.B., M.A., Ph.D.
John H. Martin, B.A., M.A., Ph.D.
Alan R. Rosen, B.A., M.A.
Joan F. Santas, B.A., M.A., Ph.D.
Hassell B. Sledd, B.A., M.A., Ph.D.
Gerald M. Weisenberg, B.A., M.A.

Associate Professors

Raymond E. Blois, B.S., M.A., Ph.D.
Benedetto Fabrizi, B.S., M.A., D.M.L.
George Khiralla, S.B., A.M.

Lecturers

Robert J. Blanch, A.B., M.A., Ph.D.
Gladys Garber, B.A., M.A.
Martin L. Robbins, B.A., M.S.
Louis E. Roberts, A.B., M.A.
C. Robert Sprich, B.S., M.A.
Florence N. Trefethen, A.B., M.Litt.
Rober E. Wiehe, B.A., M.A., Ph.D.

Assistant Professors

Samuel J. Bernstein, B.A., M.A.,
Ph.D.
Gerald R. Griffin, B.A., M.A.

Admission

To be enrolled for graduate work in English, applicants must have obtained a bachelor's degree from a recognized institution with an undergraduate program which included at least 18 semester hours of English beyond the freshman level. A quality-point average of 2.8 in undergraduate English courses is also required.

Applicants for the full-time program must take the aptitude and literature portions of the Graduate Record Examination, and scores must be received before their applications can be considered complete. Applicants for the part-time program, who plan to matriculate for the degree, must take the aptitude and literature portions of the Graduate Record Examination within six months of their initial date of registration, and must in any case qualify for admission in all other respects.

Program

Forty-two quarter hour credits of academic work are required. The course work must include Group I, 30.800, Introduction to Research Methods (three quarter hours); six hours from courses in Group II; one nine-hour unit from courses in Group III; and nine hours from courses in

Group IV, which are designated Seminars, and which are limited in enrollment to 12 students. The remaining 15 hours may be elected from courses in any group (II, III, IV, or V), but it should be noted that some of these courses are to be considered as indivisible six- or nine-hour units. Further, of these 15 hours, up to nine may be elected from courses offered in other departments, in related disciplines, with the approval of the English Department Committee on Graduate Studies.

A thesis is optional, with the approval of the English Department Committee on Graduate Studies. If approved, a thesis carries six quarter hours of credit.

Comprehensive Examination

A three-hour comprehensive examination will be required of all degree-candidate students toward or at the end of their course work.

Language Requirement

The degree candidates must pass a reading examination in one modern foreign language, to be approved by the department. This examination should be passed as early as possible.

DESCRIPTION OF COURSES

All courses carry three quarter hours of credit.

GROUP I: RESEARCH (three quarter hours required)

30.800 Introduction to Research Methods

Materials and techniques of research in English and American literature; bibliography; form and content of papers and theses.

(Offered Fall, Winter, and Spring Quarters)

GROUP II: ENGLISH LANGUAGE (six quarter hours required)

30.810 Introductory Anglo-Saxon

The reading and translating of selections of prose from the outset, with progression from the simpler types. Phonology, morphology, and syntax will be treated as needed. Pertinent matters of linguistics will be considered.

(Offered Fall Quarter)

30.811 Beowulf

Prep. 30.810

The reading and translating of part of the Anglo-Saxon epic, **Beowulf**.

(Offered Winter Quarter)

30.820 Chaucer I

Troilus and Criseyde; Fragments 1, 2, and 7 of the **Canterbury Tales**, with particular attention to the tales of the Knight, the Shipman, the Prioress, and the Priest.
(Offered Fall Quarter)

30.821 Chaucer II

Prep. 30.820

Fragments 3, 4, 5, 6, 8, 9, and 10 of the **Canterbury Tales**, with particular attention to the tales of the Wife of Bath, the Clerk, the Merchant, the Pardoner, and the Manciple.
(Offered Winter Quarter)

30.830 Historical Linguistics I

Written records; the classification of languages; phonetics and phonetic change; the comparative method; dialect geography.

(Offered Fall Quarter)

30.831 Historical Linguistics II

Prep. 30.830

Continuation of 30.830. Fluctuation; analogic and semantic change; cultural, intimate, and dialect borrowing.

(Offered Winter Quarter)

GROUP III: LITERARY PERIODS AND MOVEMENTS

(nine quarter hours required)

30.860 Major British Writers I*

A close study of selected major British writers from Chaucer through Pope. Work in criticism supplements the primary reading material.

(Offered Fall Quarter)

30.861 Major British Writers II*

Prep. 30.860

A comprehensive survey of the major poetry and prose of the Romantic Age, with emphasis on Wordsworth, Coleridge, Byron, Shelley, and Keats.

(Offered Winter Quarter)

30.862 Major British Writers III*

Prep. 30.861

A study of main trends in British literature in the last one hundred years, as illustrated in the works of Browning, Tennyson, Arnold, Yeats, Joyce, and Eliot.

(Offered Spring Quarter)

30.870 Medieval English Literature I

A study of Chaucer, in context and perspective, with particular emphasis on parts of **The Canterbury Tales** not covered in 30.820 and 30.821.

(Offered Fall Quarter)

30.871 Medieval English II

Prep. 30.870

A study of major works in Middle English, including the **Parlement of the Three Ages**, Wynnere and Wastoure, Chaucer's **Parlement of Fowles**, and **Tristan and Ysolt**.

(Offered Winter Quarter)

*30.860, 30.861, and 30.862 are offered only for students who have had no undergraduate survey or full-year period course.

30.872 Medieval English Literature III

Prep. 30.871

A continuing study of major works in Middle English, including **Sir Gawaine and the Green Knight**, **The Pearl**, and **Piers Plowman**. (Offered Spring Quarter)

30.873 Non-Dramatic Literature of the Sixteenth Century I

Poetry (and some prose) of Skelton, Hawes, Wyatt, Surrey, More, Elyot, and others, making appropriate use of Northeastern's microfilms of English books. Class reports, a brief critical paper, and a long paper. (Offered Fall Quarter)

30.874 Non-Dramatic Literature of the Sixteenth Century II . . Prep. 30.873

A continuation of 30.873, with particular attention to Spenser (except for **The Faerie Queene**), Sidney, Shakespeare, Daniel, Drayton, and others. (Offered Winter Quarter)

30.875 Non-Dramatic Literature of the Early Seventeenth Century

Prep. 30.874

A continuation of 30.874, with particular attention to Jonson, Donne, Herrick, Herbert, Vaughan, Marvell, Bacon, Browne, and others. (Offered Spring Quarter)

30.880 Non-Dramatic Literature of the Restoration and Eighteenth Century

Poetry and prose from 1660 to 1725, with particular attention to the origins and development of verse satire, especially Dryden, Samuel Butler, and Pope. (Offered Fall Quarter)

30.881 Non-Dramatic Literature of the Eighteenth Century I Prep. 30.880

A continuation of 30.880, with special attention to the prose satirists, particularly Swift, Addison, and Goldsmith. (Offered Winter Quarter)

30.882 Non-Dramatic Literature of the Eighteenth Century II Prep. 30.881

A continuation of 30.881, with special attention to the beginnings of English biography, leading up to and including Johnson and Boswell. (Offered Spring Quarter)

30.890 Studies in Romanticism I

The origins and development of the early romantic movement. Close reading and discussion of works by Wordsworth and Coleridge. (Offered Fall Quarter)

30.891 Studies in Romanticism II

Prep. 30.890

A further study of poetry and aesthetic theory in the nineteenth century, with emphasis on the works of Keats and Shelley. (Offered Winter Quarter)

30.892 Studies in Romanticism III

Prep. 30.891

Special consideration of works by Blake, Byron, and some of the prose writers of the Romantic Age. (Offered Spring Quarter)

30.893 Victorian Studies I

Chiefly a close study of the work of Matthew Arnold, in context, and discussion of selected criticism. (Offered Fall Quarter)

30.894 Victorian Studies II

Prep. 30.893

A study chiefly of the work of George Eliot; her relationship to the context of her age and her contemporaries. Discussion of selected criticism. (Offered Winter Quarter)

30.895 Victorian Studies III

Prep. 30.894

A comparative study of two or three significant Victorian figures, to be specified. (Offered Spring Quarter)

30.897 Literary Criticism I

Literature and critical principles, classical and medieval. Special attention to Plato, Aristotle, Horace, Longinus, and Dante. (Offered Fall Quarter)

30.898 Literary Criticism II

Prep. 30.897

English and Continental critical principles and relevant literary works from the Renaissance (Sidney, Jonson, and others), through Tolstoy. (Offered Winter Quarter)

30.899 Literary Criticism III

Prep. 30.898

English, Continental, and American critical principles in theory and as embodied in the modern novel, drama, poem, and short story. (Offered Spring Quarter)

GROUP IV: SEMINARS**30.901 Seminar in Linguistics I (History of the English Language)**

The nature and origin of language; ancestry and early growth of English; English phonetics, sound-change, and history of English sounds; history of English inflections; sources of the vocabulary; the making of words.

(Offered Fall Quarter)

30.902 Seminar in Linguistics II

Prep. 30.801

Semantic change; syntax and usage; dictionaries, spelling, pronunciation, variations, and usage. (Offered Winter Quarter)

30.903 Seminar in Anglo-Saxon

Prep. 30.810 and 30.811

The reading and translating of parts of *Beowulf*, in greater depth than in 30.811, and of other Anglo-Saxon literature, both poetry and prose.

(Offered Spring Quarter)

30.904, 30.905, 30.906 Problems in Literary Criticism I, II, III

Prep. Permission of Instructor

Studies in depth of various critical disciplines, as derived from literary and aesthetic theories and from various traditions. The particular critical problems will vary from quarter to quarter.

(30.904 offered Fall Quarter; 30.905 offered Winter Quarter;
30.906 offered Spring Quarter)

30.907 Seminar in Comedy

The Comic Spirit and its manifestations in dramatic literature and performance. The nature and forms of comic playwriting from Aristophanes to the present. An examination of the theatre's comic forms — farce, comedy, satire, parody.

(Offered Fall Quarter)

30.908 Seminar in Tragedy

The nature of tragic drama based on the study of plays and theories. An examination of the various ancient and modern attitudes toward the problems of tragedy. (Offered Winter Quarter)

30.909 Seminar in Theatrical Styles

An examination of the realistic-naturalistic, expressionistic, and experimental theatrical styles. (Offered Spring Quarter)

30.912 Shakespeare: The Comedies

The major comedies from *The Taming of the Shrew* to *The Tempest*. (Offered Fall Quarter)

30.913 Shakespeare: The History Plays

The English history plays, concentrating on two tetralogies, *Henry VI* to *Richard III*, and *Richard II* to *Henry V*. (Offered Winter Quarter)

30.914 Shakespeare: The Tragedies

The principal tragedies, including *Hamlet*, *Othello*, *King Lear*, *Macbeth*, *Coriolanus*, and *Anthony and Cleopatra*. (Offered Spring Quarter)

30.915 Elizabethan and Jacobean Drama

Studies in Elizabethan drama, exclusive of Shakespeare, and of its origins. Collateral readings in criticism, in addition to selected plays. The later developments of drama, both comedy and tragedy, to 1642. (Offered Fall Quarter)

30.916 Restoration and Eighteenth Century Drama

Studies in Restoration drama, especially the heroic tragedy and comedy, from Dryden to Congreve; also later plays, with particular emphasis on the development of the "sentimental comedy" of the eighteenth century. (Offered Winter Quarter)

30.917 Modern English and Irish Drama

English drama from 1890 to the present, with emphasis on the social drama and the "well-made" play, and later experimental forms. Irish dramatists to be studied will include Synge and O'Casey. (Offered Spring Quarter)

30.920 The Romance in America

A critical study of the romance as a literary form, with special emphasis on the work of Poe, Hawthorne, and Melville. (Offered Fall Quarter)

30.921 American Transcendentalism

A critical study of the American Transcendental Movement, with special emphasis on the works of Emerson, Thoreau, and Whitman. (Offered Winter Quarter)

30.922 The Rise of Realism

An examination of Local Colorism, Realism, and Naturalism in the works of Twain, Howells, James, Dreiser, and Norris. (Offered Spring Quarter)

30.933 Spenser

The Faerie Queene, with attention to the minor poems as an aid to understanding the major work. (Offered Fall Quarter)

30.934 Milton I

Minor poems and prose of Milton, with particular attention to **Lycidas**, **Samson Agonistes**, **Areopagitica**, **L'Allegro**, **Il Penseroso**, **Comus**, and the sonnets.

(Offered Winter Quarter)

30.935 Milton II

Prep. 30.934

Paradise Lost, with particular attention to the theological and scientific background. (Offered Spring Quarter)

30.950 Thomas Hardy

A study in depth of Hardy's novels, poetry, and **The Dynasts**.

(Offered Fall Quarter)

30.951 Joseph Conrad

A study in depth of the novels.

(Offered Winter Quarter)

30.952 Henry James

A study in depth of the major works, the short stories, and the aesthetic of James. (Offered Spring Quarter)

30.954 Wallace Stevens

A study in depth of the accomplishment of Wallace Stevens, with particular attention to his place in the Romantic tradition and to modernism.

(Offered Fall Quarter)

30.955 Frost and Robinson

The accomplishment of Robert Frost with special emphasis on his relation to the native tradition. The accomplishment of Robinson, and his attempt to establish a literary tradition. (Offered Winter Quarter)

30.956 Auden

W. H. Auden as a representative poet of his age. A study in depth of his accomplishments in poetry, drama, and criticism. (Offered Spring Quarter)

30.957 Eugene O'Neill

A study in depth of the major plays, and of O'Neill's development.

(Offered Fall Quarter)

30.958 Ionesco, Beckett, Genet

A study of the plays of three contemporary masters, and of their impact on the contemporary theatre. (Offered Winter Quarter)

30.959 Shaw

A study of the major plays, in historical and social context, with emphasis on Shaw's concept of drama. (Offered Spring Quarter)

GROUP V: TYPES AND SPECIAL TOPICS

30.960 Literary Composition: Fiction

The writing of fiction, with emphasis on the short story. Assignments in various modes and techniques, with particular attention to contemporary forms. Collateral readings in the short story from Hawthorne to Frank O'Connor. Critiques.
(Offered Fall Quarter)

30.961 Literary Composition: Poetry

The writing of poetry, with emphasis on the elements of prosody. Assignments in various forms. Collateral readings and critiques. (Offered Winter Quarter)

30.962 Literary Composition: Essay

The essay, the sketch, and criticism as literary forms. Assignments in various forms. Collateral readings and critiques, and an examination of prose style.
(Offered Spring Quarter)

30.966 Dante and His Times: Minor Works

Dante's life and minor works as seen through the literary, political, and religious background of his times.
(Offered Fall Quarter)

30.967 Dante: Divina Commedia — Inferno

Prep. 30.966

General study of the Divina Commedia with particular analysis of the "Inferno."
(Offered Winter Quarter)

30.968 Dante: Divina Commedia — Purgatorio and Paradiso

Prep. 30.967

Close examination of the two "cantiche" of Dante's major work.
(Offered Spring Quarter)

30.970 English Novelists I

The eighteenth-century novel, its origins and development, with special attention to Defoe, Richardson, Fielding, Smollett, Sterne, and Austen.
(Offered Fall Quarter)

30.971 English Novelists II

Prep. 30.970

The nineteenth-century novel, with special attention to the Brontës, Dickens, Thackeray, Trollope, Eliot, and Hardy.
(Offered Winter Quarter)

30.972 English Novelists III

Prep. 30.971

From the late nineteenth century to the present, with special attention to James, Conrad, Forster, Bennett, Joyce, and Lawrence.
(Offered Spring Quarter)

30.980 The Modern Tradition I

The late Victorian and Edwardian periods. Writers to be studied include, or will be chosen from, Hopkins, Hardy, the early Yeats, Shaw, Wells, Bennett, the American naturalists, Cather, Robinson, Frost. Cross-currents in Continental movements in art and literature.
(Offered Fall Quarter)

30.981 The Modern Tradition II

Prep. 30.980

Writers between the wars, including D. H. Lawrence, Woolf, Aldous Huxley, the later Yeats, Auden; T. S. Eliot, Wallace Stevens, Fitzgerald, Hemingway, William Carlos Williams, Stein, Faulkner. Dadaism, and surrealism, and the ferment of experimentalism.
(Offered Winter Quarter)

30.982 The Modern Tradition III Prep. 30.981
 Writers and movements since World War II, including Thomas, Amis, Wain, C. P. Snow, Updike, Cheever, Lowell, Dickey, and "the new poets."
(Offered Spring Quarter)

30.987 The American Novel I (1900–1929)
 A study of the changing technical, thematic, and influential elements in the works of Cather, Wharton, Cabell, Anderson, Hemingway, Faulkner, and Lewis.
(Offered Fall Quarter)

30.988 The American Novel II (1930–1949)
 A critical study of the themes, techniques, and influences of this period as expressed in the works of Faulkner, Farrell, Wolfe, Warren, Dos Passos, and Steinbeck.
(Offered Winter Quarter)

30.989 The American Novel III (1950–1965)
 An examination of recent trends in the novel as expressed in the works of Salinger, Mailer, Bellow, Barth, Roth, Rand, and Baldwin.
(Offered Spring Quarter)

30.991 Semantics
 The relation between language and behavior; the concept of change, variety, and uniqueness; symbols; levels of abstraction; habits of evaluation of linguistic phenomena; and modification of such habits in the direction of human adjustment, understanding, and survival.
(Offered Spring Quarter)

30.992 Descriptive Linguistics
 Articulatory and acoustic phonetics; phonemes and phonemic transcribing; morphemes and morphology; inflections and syntactic devices; transformations; the process of communication.
(Offered Spring Quarter)

GROUP VI: DIRECTED STUDY AND THESIS

30.996 Directed Study Prep. Permission of Instructor
 Individual work on special topics, for students who have completed required courses.
(Offered every quarter)

30.997 Thesis

History

Professors

Raymond H. Robinson, B.A., M.A.,
Ph.D., Chairman
Wallace P. Bishop, B.A., M.A., Ph.D.

Stanley R. Stembridge, B.A., M.A.,
Ph.D.

Assistant Professors

David Brudnoy, B.A., M.A.

Associate Professors

Philip N. Backstrom, Jr., B.A.,
M.A., Ph.D.
Robert A. Feer, B.A., M.A., Ph.D.
Martha E. Francois, B.A., M.A.,
Ph.D.
Norbert L. Fullington, B.A., M.A.,
Ph.D.

Lecturers

Merle D. Goldman, B.A., M.A., Ph.D.
Walter S. Jones, Jr., A.B., M.A.,
M.A.L.D.

Instructors

Suzanne Hammer, B.A., M.A.

THE MASTER'S DEGREE

Admission

To be admitted for graduate work in history, applicants must have obtained a bachelor's degree from a recognized institution with an undergraduate program which included at least 15 semester hours of history.

Applicants for the full-time program must take the aptitude and history achievement portions of the Graduate Record Examination in the Fall or Winter before they make application; applicants for the part-time program are strongly urged to take the Graduate Record Examination.

Program

Forty-two quarter hour credits of academic work are required. The course work must include 23.800, Methodology and Early Historiography; 23.801, Modern European Historiography; 23.900, American Historians; and two courses specifically labeled "seminar." Students enrolling in seminars must have time available for research in libraries.

Full-time students take four courses each quarter, thereby completing 36 quarter hours during the Fall, Winter, and Spring Quarters. The remaining credits may be taken during the Summer session preceding or following the normal academic year.

For all students the distribution of courses must be such that not more than 24 quarter hours of credit are taken in either Group I or Group II.

GROUP I — EASTERN HEMISPHERE

- 23.800 Methodology and Early Historiography
- 23.801 Modern European Historiography
- 23.802 Ancient Greece
- 23.803 Ancient Rome
- 23.806 Intellectual History of Europe, 1688-1789
- 23.807 Intellectual History of Europe, 1789-1870
- 23.808 Intellectual History of Europe, 1870-1950
- 23.810 Social and Economic History of Europe, 400-1450
- 23.811 Social and Economic History of Europe, 1450-1650
- 23.812 Seminar in Social and Economic History of Europe, 1650-1850
- 23.817 Medieval Institutions
- 23.818 Seminar in the Renaissance
- 23.820 The Renaissance
- 23.821 The Reformation
- 23.826 English Medieval Constitutional History
- 23.827 Seminar in England, 1558-1660
- 23.830 British History, 1688-1815
- 23.831 British History, 1815-1914
- 23.832 Seminar in Twentieth Century Britain
- 23.833 Seminar in Nineteenth Century Britain
- 23.835 France, 1180-1661
- 23.836 France, 1661-1830
- 23.840 France and Germany, 1870-1918
- 23.841 France and Germany since 1918
- 23.845 Seminar in Nineteenth Century Europe
- 23.850 Seminar in Russian History
- 23.855 European Socialist Thought
- 23.860 Diplomatic History of Europe, 1815-1914
- 23.862 Twentieth Century Europe
- 23.863 Seminar in Twentieth Century Europe
- 23.870 China to 1800
- 23.871 Modern China
- 23.873 Japan to 1600
- 23.874 Japan, 1600-1868
- 23.875 Modern Japan

GROUP II — WESTERN HEMISPHERE

- 23.900 American Historians
- 23.905 Colonial America: The Seventeenth Century

- 23.906 Colonial and Revolutionary America: The Eighteenth Century
- 23.908 Seminar in Colonial America: The Seventeenth Century
- 23.909 Seminar in Colonial and Revolutionary America: The Eighteenth Century
- 23.910 American Social History, 1607–1815
- 23.911 American Social History, 1815–1900
- 23.912 American Social History, 1900–1950
- 23.913 American Intellectual History, 1750–1865
- 23.914 American Intellectual History since the Civil War
- 23.915 Seminar in American Intellectual History
- 23.917 American Cultural History
- 23.918 Seminar in American Cultural History
- 23.920 Seminar in American Urban History
- 23.925 Seminar in American Economic History
- 23.930 The Westward Movement in the United States in the Nineteenth Century
- 23.931 Man and Land in the United States in the Twentieth Century
- 23.935 Seminar in Recent American History
- 23.941 American Diplomatic History, 1775–1889
- 23.942 American Diplomatic History since 1889
- 23.943 Seminar in American Diplomatic History
- 23.970 The United States and the Caribbean Region
- 23.971 Mexican History
- 23.973 South America to 1900
- 23.974 South America since 1900
- 23.975 Seminar in South American History

With the approval of the faculty adviser, a maximum of nine quarter hours of credit may be elected from graduate courses in other departments and a maximum of 12 quarter hours of credit may be elected from advanced undergraduate courses in history.

A thesis is optional with the approval of the Chairman of the Department. If approved, a thesis carries nine quarter hours of credit.

Comprehensive Examination

This examination will be held in accordance with the general Graduate Division regulations.

Language Requirement

In accordance with the general Graduate Division regulations, proficiency must be demonstrated in a foreign language, to be approved by the department.

DESCRIPTION OF COURSES

All courses carry three quarter hour credits unless otherwise specified.

23.800 Methodology and Early Historiography

The objectives, methods, and resources of the historian; an analysis of the historical writings of ancient and medieval times.

(Offered yearly, Fall Quarter)

23.801 Modern European Historiography

The development of historical writing from the Renaissance to the present. Representative historians will be studied and there will be some consideration of the philosophy of history.

(Offered yearly, Winter Quarter)

23.802 Ancient Greece

Selected topics in the history of ancient Greece.

23.803 Ancient Rome

Selected topics in the history of Rome in the period of the Republic or the Empire.

23.806 Intellectual History of Europe, 1688–1789

The broad spectrum of eighteenth-century thought, with emphasis on scientific, religious, and political ideas.

23.807 Intellectual History of Europe, 1789–1870

The great age of liberal and nationalistic thought. Social problems created by industrialism and various proposals to solve these problems will be examined.

23.808 Intellectual History of Europe, 1870–1950

The intellectual developments which have brought Europe to its present position in world affairs. Topics considered include theories of evolution, scientism, radical socialism, and fascism.

23.810 Social and Economic History of Europe, 400–1450

Emergence of localism and manorialism in the early Middle Ages; commercial revival and town development in the twelfth and thirteenth centuries; economic decline and plague in the later Middle Ages.

23.811 Social and Economic History of Europe, 1450–1650

Social structure, standards of living, and economic development in an age of exploration, renaissance, and reformation.

23.812 Seminar in Social and Economic History of Europe, 1650–1850

Exploration of social and economic developments in the light of the "revolutions" (intellectual, political, agricultural, and industrial) which took place during this period.

28.817 Medieval Institutions

Political, economic, and religious institutions in England and France from the fourth to the thirteenth centuries.

23.818 Seminar in the Renaissance

Research and writing in topics concerning the Renaissance.

23.820 The Renaissance

European political and cultural life from the thirteenth to the seventeenth centuries, with attention to Humanism and to the rebirth of classicism in literature and the arts.

23.821 The Reformation

The development of the Christian Church from the thirteenth to the seventeenth centuries, with attention to the conflict between church and state, the impact of the Renaissance, the rise of the Protestant sects, and the wars of religion.

23.826 English Medieval Constitutional History

A study of the traditions and institutions which contributed to the development of common law and parliamentary government from the time of Alfred through the reign of Henry VIII.

23.827 Seminar in England, 1558-1660

A study of political, religious, social, and economic problems from Elizabeth I to the Restoration.

23.830 British History, 1688-1815

The great constitutional and parliamentary developments in Britain from the Glorious Revolution to Waterloo, with attention to social and economic aspects of the same period.

23.831 British History, 1815-1914

The age of Pax Britannica, with emphasis on the growth of democracy, social reform and socialism, and Victorian society and culture.

23.832 Seminar in Twentieth Century Britain

The seminar will focus on British political parties in the 1930's, with special emphasis on the development of their foreign policies.

23.833 Seminar in Nineteenth Century Britain

Liberalism, conservatism, and the progress of the English people will be the theme of the seminar.

23.835 France, 1180-1661

The history of France from the time of Philip II to the majority of Louis XIV with special emphasis on the problems of cultural, political, and economic unity and the effects of the Renaissance and the Reformation.

23.836 France, 1661-1830

A study of the "Old Regime," including an examination of the reign of Louis XIV, the decline of the French monarchy in the eighteenth century, and the general effects of the Enlightenment; an analysis of the revolutionary period, 1789 to 1830.

23.840 France and Germany, 1870-1918

The rise of Germany as the dominant power in Europe in 1870-71, with attention to French attempts to regain power and to German attempts to maintain and extend their influence.

23.841 France and Germany since 1918

The continuing struggle of France and Germany for European hegemony in the light of new theories and new international factors.

23.845 Seminar in Nineteenth Century Europe

Research and writing in European history from 1850 to 1900.

23.850 Seminar in Russian History

A narrow period or special topic in Russian history. The course presupposes a basic knowledge of Russian history and will require extensive work on a research paper.

23.855 European Socialist Thought

Studies in the history of socialism from the early nineteenth century utopias to the New Left.

23.860 Diplomatic History of Europe, 1815–1914

The foreign policies of the chief European powers, with emphasis on changing alliances and alignments, imperialistic rivalries, and efforts at international cooperation.

23.862 Twentieth Century Europe

The political history of Europe since 1900, with attention to World War I, the rise of Communism and Fascism, the struggle for security in the western democracies, World War II, and the Cold War.

23.863 Seminar in Twentieth Century Europe

A study of selected political controversies in Europe since 1900.

23.870 China to 1800

History of Chinese civilization from antiquity through Confucianism to the period of Western impact.

23.871 Modern China

Revolution and institutional change in China from the nineteenth century to the present, including a study of the Communist period.

23.873 Japan to 1600

A survey of early Japanese history with special emphasis on the social, political, intellectual, and literary history of the medieval period.

23.874 Japan, 1600–1868

A study of the Tokugawa period, emphasizing the problems of late feudal control, urban and rural developments, social, intellectual, and literary history.

23.875 Modern Japan

The history of Japan since the fall of the Tokugawa, emphasizing political and economic developments, especially after World War II.

23.900 American Historians

The writing of American history by Americans from colonial times to the present with emphasis on changes in both form and substance.

(Offered yearly, Spring Quarter)

23.905 Colonial America: The Seventeenth Century

Exploration of the New World, settlement of the English North American mainland colonies, and the adaptation of European institutions and ideas to New World conditions.

23.906 Colonial and Revolutionary America: The Eighteenth Century

The expansion of the English colonies in the New World, the development of political and social institutions, and the sources of friction with England.

23.908 Seminar in Colonial America: The Seventeenth Century

Research and writing on some topic in the history of the English colonies during the seventeenth century.

**23.909 Seminar in Colonial and Revolutionary America:
The Eighteenth Century**

Research and writing on some topic in eighteenth century American history prior to 1789.

23.910 American Social History, 1607-1815

The ethnic foundation of American society; the ways Americans made their livings, and the ways in which they lived during the colonial and early national periods.

23.911 American Social History, 1815-1900

The King Cotton society of the South, the ferment of reform and industrialism in the North, the Civil War, and the materialistic civilization of the late nineteenth century.

23.912 American Social History, 1900-1950

The transformation of the naive and idealistic America of the early twentieth century to life in a world in which technology has far outstripped man's mental and moral capacity to cope with it.

23.913 American Intellectual History, 1750-1865

American attitudes toward the individual and toward government during the Enlightenment, the romantic movement, and the slavery controversy.

23.914 American Intellectual History since the Civil War

The adaptation of the ideas of an agricultural society to the conditions of an urban and industrial society.

23.915 Seminar in American Intellectual History

The seminar will focus upon a single figure in American intellectual history. His writings and writings about him will be analyzed. Seminar papers will be required of all students.

23.917 American Cultural History

The transplanting of European culture and the development of an American culture as reflected in American architecture.

23.918 Seminar in American Cultural History

Research and writing on some aspect of American culture.

23.920 Seminar in American Urban History

The political, economic, and social history of America's major cities, with special emphasis on Boston's last century.

23.925 Seminar in American Economic History

The development of the American economy from 1800 to the present, with special attention to the history of transportation. Topics include the development of highways, canals, railroads, and airlines, with an examination of the roles of private enterprise and government.

23.930 The Westward Movement in the United States in the Nineteenth Century

Westward migration into the various geographic provinces will be traced, with emphasis upon its causes, processes, and its economic and political influences. Economic aspects stressed will be those relating to the land: agriculture, mining, lumbering, and grazing.

23.931 Man and Land in the United States in the Twentieth Century

Aspects of land use in America since the closing of the frontier, with attention to agriculture and mining and to conservation programs.

23.935 Seminar in Recent American History

Special topics from the period 1896 to 1960 will be studied in detail, and students will present a research paper on a major person, action, or movement.

23.941 American Diplomatic History, 1775-1889

The history of American foreign policy and foreign relations from the American Revolution to 1889.

23.942 American Diplomatic History since 1889

The United States in the age of world involvement and responsibility; the imperialistic episode; the world wars; international organizations and alliances.

23.943 Seminar in American Diplomatic History

Research and writing on selected topics in the history of American foreign relations.

23.970 The United States and the Caribbean Region

The Caribbean policy of the United States from the Monroe Doctrine, Manifest Destiny, Imperialism, the Big Stick, Dollar Diplomacy to the Good Neighbor and Alliance for Progress.

23.971 Mexican History

The making of modern Mexico from its Indian and Spanish beginnings to the present.

23.973 South America to 1900

The European impact on South America, the movements for independence, and the nineteenth-century history of the new republics.

23.974 South America since 1900

The internal developments of the South American republics and their relations with one another and with other nations in the twentieth century.

23.975 Seminar in South American History

Research and writing on special topics in the history of the South American republics.

23.990 Assigned Reading in History

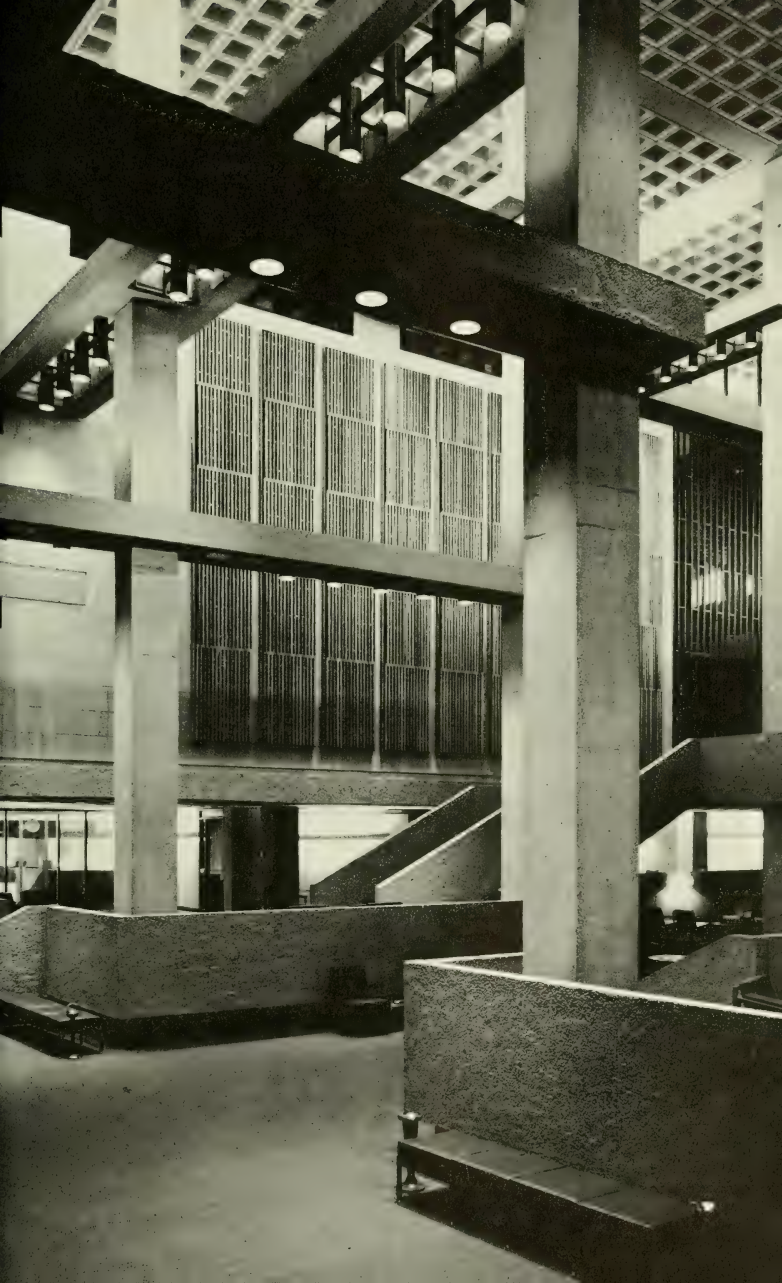
Assigned reading under supervision of a faculty member.

Credits: 1 quarter hour.

23.991 Thesis

Thesis supervision by members of the department.

Credits: 9 quarter hours.





Mathematics

Professors

Harold L. Stubbs, A.B., M.A.,
Ph.D., Chairman
Daniel Gorenstein, B.A., M.A.,
Ph.D.
Arshag B. Hajian, M.A., Ph.D.
Valentin Poenaru, Dr. Sci.
Flavio B. Reis, B.S., M.S., Ph.D.
Giuliano Sorani, Laurea
Jack Warga, B.A., Ph.D.
Pierre E. Dolbeault, Agr., Dr. Sci.
(Visiting, 1968–69)
Barry C. Mazur, Ph.D.
(Visiting, 1967–68)
Lucien Waelbroeck, Lic., Dr. Sci.
(Visiting, 1968–69)

Associate Professors

Robert A. Bonic, M.S., Ph.D.
David I. Epstein, B.A., Ph.D.
Holland C. Filgo, Jr., B.S., M.A.,
Ph.D.
Alberto R. Galmarino, B.S., Ph.D.
Robert D. Klein, B.A., M.S.
Victor R. Staknis, B.S., M.A., Ph.D.
Jonathan L. Alperin, A.B., A.M.,
Ph.D. (Visiting, 1967–68)

Assistant Professors

Jacob Barshay, A.B., M.A., Ph.D.
John Frampton, B.S., M.S., Ph.D.

Lecturers

Kurt Arbenz, M.S., Ph.D.
Albert Arcese, B.S., M.A.
Donald R. Childs, B.S., M.S., Ph.D.
Philip Davis, B.A., M.A.

Eugene DeLuca, B.S., M.S., M.S.
George J. Fix, B.S., M.S.
David Gootkind, B.S., M.S.
Donald W. Hinkkanen, B.A., M.A.
Irving Kanter, A.B., Ph.D.
Walter E. Knabe, Arb., Ph.D.
Ira Kohlberg, B.E.E., M.S., Ph.D.
Theodore R. Kornreich, B.Ch.E.,
M.S.E., Ph.D.
Carlton G. Lehr, B.S., M.S.
Leonard Lesensky, B.A., M.A., Ph.D.
Joseph D. Lordan, B.S.
Ward C. Low, B.S., Ph.D.
Jack Mettauer, B.A., M.A.
James Misho, B.S., A.M.
I. Larry Morris, M.E., S.M.E.E., Ph.D.
Peter P. Philliou, B.S., M.S., M.S.
Lawrence Rosenfeld, B.S., M.A., Ph.D.
John N. Rossettos, S.B., S.M., M.A.,
Ph.D.
Harry A. Rothmann, B.S., M.S.
George C. Sethares, Mus. B., M.A.,
Ph.D.
Rocco Urbano, B.A., M.A.
Albert C. Vosburg, B.A., M.S., Ph.D.
Neal T. Watson, B.A., M.A.
David M. Waxman, B.A., M.S.
Israel J. Weinberg, B.A., S.M., Ph.D.
Lee A. Young, B.A., A.M., Ph.D.

Instructors

Samuel J. Blank, B.A., Ph.D.
Mark Bridger, B.A., M.A., Ph.D.
Tamar Burak, M.S., Ph.D.
Maurice E. Gilmore, A.B., M.S.,
Ph.D.
Richard Rasala, A.B., A.M.

Admission

To be enrolled for graduate work in mathematics, applicants must have obtained a bachelor's degree from a recognized institution with an undergraduate program which included at least one semester of linear algebra, one semester of modern algebra, and two semesters of advanced calculus.

THE MASTER'S DEGREE

FULL-TIME PROGRAM

Options are available in either pure mathematics or applied mathematics. The latter program operates primarily on the Cooperative Plan as described later. The following courses are required.

		Credits
10.913	Theory of Functions of a Real Variable	4
10.914	Theory of Functions of a Real Variable	4
10.917	Theory of Functions of a Complex Variable	4
	or	
10.905	Complex Analysis	4
10.920	Theory of Functions of a Complex Variable	4
	or	
10.906	Complex Analysis	4
		<u>16</u>

Pure Mathematics Option

Forty quarter hours of academic credit are required. The program of courses will be approved by a faculty adviser and will normally be taken according to the following pattern by students who devote about half time to teaching or other responsibilities. (Students who do not have such responsibilities may pursue the program at an accelerated rate.)

FIRST YEAR			
Fall Quarter	Credits	Winter Quarter	Credits
10.913 Theory of Functions of a Real Variable	4	10.914 Theory of Functions of a Real Variable	4
10.924 Algebra	<u>4</u>	10.925 Algebra	<u>4</u>
	8		8
Spring Quarter		Credits	
10.931 Functional Analysis		4	
10.926 Algebra		<u>4</u>	
		8	

SECOND YEAR

Fall Quarter	Credits	Winter Quarter	Credits
10.917 Theory of Functions of a Complex Variable	4	10.920 Theory of Functions of a Complex Variable	4
10.907 Algebraic Topology	$\frac{4}{8}$	10.908 Algebraic Topology	$\frac{4}{8}$
Spring Quarter		Credits	
Elective		$\frac{4}{4}$	

Applied Mathematics Option

Forty quarter hours of academic credit are required. This program operates on the Cooperative Plan in which students take academic work in the Fall and Spring Quarters of the first year and in the Fall and Winter Quarters of the second year. In the two academic years, three quarters are available for professional work.

The sequence of courses are normally taken according to the following pattern:

FIRST YEAR

Fall Quarter	Credits	Spring Quarter	Credits
10.913 Theory of Functions of a Real Variable	4	10.914 Theory of Functions of a Real Variable	4
10.905 Complex Analysis	4	10.906 Complex Analysis	4
10.873 Matrix Analysis ..	$\frac{4}{12}$	10.843 Advanced Differential Equations	$\frac{4}{12}$

SECOND YEAR

Fall Quarter	Credits	Winter Quarter	Credits
10.848 Partial Differential Equations	3	10.849 Partial Differential Equations	3
10.865 Approximation Theory	2	10.866 Approximation Theory	2
Elective	$\frac{4}{9}$	Elective	$\frac{4}{9}$

Other Requirements

There is no comprehensive examination required and no language requirement for the master's degree. A thesis is not required but may in some cases be substituted for an elective course with the approval of the department.

PART-TIME EVENING PROGRAM

The admission requirements for this program are the same as for the full-time program, but students may progress according to their abilities and the time available.

If students are deficient in any of the mathematics courses required for admission to the degree program, they will be required to satisfy their deficiencies by taking courses given for this purpose. Such courses will carry graduate credit, but the credit will be in addition to the regular degree requirements. The following courses are required:

	Credits
10.901 General Topology	2
10.911 Theory of Functions of a Real Variable	2
10.912 Theory of Functions of a Real Variable	2
10.915 Theory of Functions of a Complex Variable	2
10.916 Theory of Functions of a Complex Variable	2
10.918 Theory of Functions of a Complex Variable	2
	<hr/> 12

Electives

Eighteen quarter hours of credit must be elected from mathematics courses. Ten quarter hours may be elected from any courses in the Graduate School of Arts and Sciences or the Graduate School of Engineering for which the student has the necessary preparation.

THE DOCTOR OF PHILOSOPHY DEGREE

Admission

Students admitted to full-time study in mathematics are eligible to take the qualifying examination in accordance with the information given under the heading of Qualifying Examination.

Applicants who have completed the requirements for their master's degree at another institution and who wish to apply at Northeastern University for doctoral work, should file an application, together with transcripts of all undergraduate and graduate work and two letters of recommendation, with the chairman of the department. The applicant will in some cases be asked to appear for an interview and subsequently be advised concerning his admittance to the program. The Departmental Graduate Committee will determine whether he should take any course work before taking the qualifying examination. The Committee will also set a date on which the candidate must take his qualifying examination.

Residence Requirements

The residence requirement is satisfied by one year of full-time graduate work or two consecutive years of half-time graduate work.

Degree Candidacy

Degree candidacy is established in accordance with the general Graduate Division regulations.

Qualifying Examination

The qualifying examination for admission to candidacy must be taken by the end of the sixth quarter of the student's work. This examination will test the student's understanding of the basic material of real and complex analysis, algebra, general topology, and either algebraic topology or differential equations. A detailed syllabus for the examination may be obtained from the chairman of the department. The student will normally prepare for the examination by taking the program described for the master's degree requirements. If any part of this examination has been failed, the Departmental Graduate Committee will decide when it may be repeated and whether the student will be allowed probationary status in the meantime.

Minor Specialty

Each doctoral candidate will select some specific mathematical subject of an advanced nature and by means of reading, lecture courses and/or seminars shall master the equivalent of one full year's course work in this area. Approval of the area in which the student intends to work should be obtained in advance from the Ph.D. committee. The purpose of this minor subject is to prevent the student's graduate training from becoming overspecialized and to guarantee some degree of breadth in his mathematical development. Consequently the topic must be sufficiently far from that area in which the student plans to write a dissertation.

When the candidate has completed his work, he will present a report on the subject in order to satisfy the Ph.D. committee of his mastery of the material. At the discretion of the committee, this report may be oral or written. The committee may also consider active participation in an appropriate seminar as a satisfactory indication of competence and allow it to be a substitute for such a report.

Course Requirements

The course requirements, in addition to the minimum master's degree requirements of 40 quarter hours of credit, are established by the Departmental Graduate Committee for each candidate. In most cases, 40 quarter hours of additional work will be required.

Thesis

After the successful completion of his qualifying examination, each student shall select a thesis adviser under whose guidance he will write his doctoral thesis. If the student wishes it, the Departmental Graduate Committee will assist him in the selection of a thesis adviser. The thesis itself must represent an original solution of a problem in the chosen area of mathematics which makes some contribution to mathematical knowledge.

Language Requirement

Ability to read and translate simple expository writing in two foreign languages must be established by each candidate. The degree of proficiency should in each case be sufficient for the student to read mathematical texts and journals with facility in the respective languages.

French, German, and Russian are the three most important foreign languages for the mathematician, in essentially equal degree, and the student may choose any two of these three languages in which to be examined. Any other choice of language must be approved by the Departmental Graduate Committee. In order to maximize the usefulness of these languages in his training, the student should take these examinations as early as possible. In any case, at least one of them must be passed before beginning work on the thesis. The examinations shall be administered by the Department of Mathematics. Further details concerning the examinations may be obtained from the Department Chairman.

Final Oral Examination

This examination will be held in accordance with the Graduate Division regulations.

DESCRIPTION OF COURSES

All courses carry two quarter hours of credit unless otherwise specified. Courses carrying three or four quarter hours of credits are offered in the day only.

The following courses are primarily for students in the engineering programs. These courses may not be used for credit toward the program in mathematics but may be taken in addition to the required course work in this field.

10.801 Advanced Mathematics

Prep. Differential Equations
Series solution of differential equations; Legendre and Bessel functions; Laplace transforms; scalar and vector fields; gradient, divergence, and curl.

(Offered yearly, every quarter)

10.802 Advanced Mathematics

Prep. 10.801, Advanced Mathematics
or Equivalent

Fourier series and integrals, orthogonal functions, boundary-value problems involving partial differential equations: wave equation, heat flow, Laplace equation.

(Offered yearly, every quarter)

10.803 Advanced Mathematics Prep. Differential Equations
Legendre and Bessel functions, Laplace transforms, Fourier integrals, boundary-value problems, introduction to matrix algebra.
Credits: 4 quarter hours. (Offered yearly. Fall and Winter Quarters)

10.804 Advanced Mathematics Prep. 10.802, Advanced Mathematics
Matrix algebra, determinants, inversion of matrices, rank and equivalence, linear equations and linear dependence, vector spaces and linear transformations.
(Offered yearly every quarter)

10.805 Advanced Mathematics Prep. 10.804, Advanced Mathematics
Further topics in matrices and vector spaces. (Offered yearly every quarter)

10.806 Advanced Mathematics Prep. Differential Equations
This course, offered to day students, embodies the material in 10.804 and 10.805, Advanced Mathematics.
Credits: 4 quarter hours. (Offered yearly, Fall and Winter Quarters)

The following courses are offered for those who wish to enter the master's degree program in mathematics, but who fail to satisfy the admission requirements in algebra and/or advanced calculus. These courses will be taken in addition to the required course work in mathematics.

Students in other programs may use these courses for elective credit.

10.811 Abstract Algebra Prep. Differential and Integral Calculus
(Offered yearly, Fall Quarter)

10.812 Abstract Algebra Prep. 10.811, Abstract Algebra
(Offered yearly, Winter Quarter)

10.813 Abstract Algebra Prep. 10.812, Abstract Algebra
The content of 10.811 and the first half of 10.812 is as follows: Groups, subgroups, normal subgroups, rings, ideals, integral domains, and fields. The content of the second half of 10.812 and 10.813 is as follows: Linear spaces, linear transformations, inner product spaces, systems of linear equations, and algebra of matrices.
(Offered yearly, Spring Quarter)

10.821 Advanced Calculus Prep. Differential and Integral Calculus
Functions of one independent variable; limits, continuity, differentiability. Properties of continuous functions on a closed bounded interval. Rolle's theorem and the mean-value theorem.
(Offered yearly, Fall Quarter)

10.822 Advanced Calculus Prep. 10.821, Advanced Calculus
Functions of several independent variables. Distance and open sets; limits, continuity. Properties of continuous functions on a closed bounded set. Differentiability and differentials, mean-value theorem, implicit function theorems, Jacobians and transformations.
(Offered yearly, Winter Quarter)

10.823 Advanced Calculus

Sequences, sequences of functions, uniform convergence, series. Integration, line and surface integrals.

Prep. 10.822, Advanced Calculus
(Offered yearly, Spring Quarter)

The following courses may be used toward the degree requirements in mathematics and in all engineering and science fields.

10.831 Probability

Fundamentals of probability theory; discrete and continuous probability distributions, including binomial, Poisson, and normal; law of large numbers and central limit theorem.

Prep. Differential and Integral Calculus
(Offered yearly, every quarter)

10.832 Probability

Further study of probability distributions for one or more random variables. Special topics such as occupancy problems and Markov chains.

Prep. 10.831, Probability
(Offered yearly, every quarter)

10.834 Mathematical Statistics

Fundamental statistical methods. Tests of significance and estimation based on large or small samples; simple correlation and linear regression.

Prep. 10.831, Probability or
Equivalent
(Offered yearly, Fall and Winter Quarters)

10.835 Mathematics Statistics

Analysis of variance; further topics in statistical inference.

Prep. 10.834, Mathematical Statistics
(Offered yearly, Winter and Spring Quarters)

10.836 Mathematical Statistics

This course, offered to day students, embodies the material in 10.834 and 10.835, Mathematical Statistics.

Credits: 4 quarter hours.

Prep. 10.831, Probability or
Equivalent
(Offered yearly, Spring Quarter)

10.838 Stochastic Processes

Markov chains with discrete time parameter. Classification and limit properties, random walk, probability spaces for an infinite family of random variables. Kolmogorov's compatibility conditions. Conditional expectations. Poisson processes, counting processes.

Prep. 10.832, Probability
(Offered yearly, Fall Quarter)

10.839 Stochastic Processes

Markov processes, Markov chains with continuous time parameter. Diffusions, Brownian motion. Stationary processes, ergodicity, weakly stationary processes, random harmonic analysis.

Prep. 10.838, Stochastic Processes
(Offered yearly, Winter Quarter)

10.841 Advanced Differential Equations

Mathematics or 10.823, Advanced Calculus
(Offered 1969-70, Fall Quarter)

Prep. 10.804, Advanced

10.842 Advanced Differential Equations Prep. 10.841, Advanced Differential Equations
(Offered 1969–70, Winter Quarter)

10.843 Advanced Differential Equations Prep. 10.913, Theory of Functions of a Real Variable

The following material is covered in 10.841 and 10.842, Advanced Differential Equations. It is also covered as a unit in 10.843, Advanced Differential Equations.

Theory of the first-order differential equation and of systems of such equations; the linear second-order equation (initial-value and two-point boundary-value problems) with emphasis on the representation of solutions by means of eigen-functions. Applications to problems in physics.

Credits: 4 quarter hours. (Offered yearly, Spring Quarter)

10.844 Advanced Differential Equations Prep. 10.842, Advanced Differential Equations

Differential equations in the complex plane; topology of integral curves; non-linear differential equations; stability theory; applications.

(Offered 1969–70, Spring Quarter)

10.845 Partial Differential Equations Prep. 10.912, Theory of Functions of a Real Variable and 10.918, Theory of Functions of a Complex Variable, or
Consent of the Instructor
(Offered 1968–69, Fall Quarter)

10.846 Partial Differential Equations Prep. 10.845, Partial Differential Equations
(Offered 1968–69, Winter Quarter)

10.847 Partial Differential Equations Prep. 10.846, Partial Differential Equations

The content of courses 10.845, 10.846, and 10.847, Partial Differential Equations is the following: Study of first-order partial differential equations, then second-order equations. Transformation theory in the plane and space; methods of solution and properties of solutions of equations with initial and boundary conditions; existence and uniqueness problems.

(Offered 1968–69, Spring Quarter)

10.848 Partial Differential Equations Prep. 10.913, Theory of Functions of a Real Variable, or
Consent of the Instructor
(Offered yearly, Fall Quarter)

10.849 Partial Differential Equations Prep. 10.848, Partial Differential Equations

The content of courses 10.848, 10.849, Partial Differential Equations is the same as that of courses 10.845, 10.846, 10.847, Partial Differential Equations.

Credits: 3 quarter hours. (Offered yearly, Winter Quarter)

- 10.850 Nonlinear Differential Equations** Prep. 10.844, Advanced Differential Equations
Nonlinear differential equations of the first order; systems of differential equations; singular points and stability; second-order nonlinear equations; results of Poincare and Lyapunov; problems in nonlinear mechanics.
(Offered 1968, Summer Quarter)
- 10.851 Integral Equations** Prep. 10.802 and 10.804, Advanced Mathematics or 10.823, Advanced Calculus or Equivalent
(Offered yearly, Winter Quarter)
- 10.852 Integral Equations** Prep. 10.851, Integral Equations
(Offered yearly, Spring Quarter)
- 10.853 Integral Equations** Prep. Advanced Calculus
The following material is covered in 10.851 and 10.852, Integral Equations. It is also covered as a unit in 10.853, Integral Equations.
Integral equations of the first, second, and third kind; systems of orthogonal functions; infinite matrices, infinite linear and bi-linear forms, applications to boundary-value problems.
Credits: 4 quarter hours.
(Offered 1969, Fall Quarter)
- 10.854 Difference Equations** Prep. 10.802 and 10.804, Advanced Mathematics or 10.823, Advanced Calculus or Equivalent
(Offered yearly, Fall Quarter)
- 10.855 Difference Equations** Prep. 10.854, Difference Equations
The content of 10.854 and 10.855, Difference Equations, is the following: Formulation and solution of difference equations; approximate solution of engineering problems by finite-difference methods; relaxation techniques; stability and convergence of approximate methods; applications.
(Offered yearly, Winter Quarter)
- 10.857 Calculus of Variations** Prep. 10.802 and 10.804, Advanced Mathematics or 10.823, Advanced Calculus or Equivalent
(Offered yearly, Spring Quarter)
- 10.858 Calculus of Variations** Prep. 10.857, Calculus of Variations
The content of courses 10.857 and 10.858, Calculus of Variations, is as follows: The concept of the first variation of a functional; the simplest variational problem; Euler's equation. Generalization to several variables. Hamilton-Jacobi theory. Sufficient conditions for extrema. Fields of extremals. Direct methods in variational problems.
(Offered 1968-69, Fall Quarter)
- 10.861 Numerical Analysis** Prep. 10.802 and 10.804, Advanced Mathematics, or Linear Algebra and Advanced Calculus
Solutions of systems of linear algebraic equations by reduction and iterative methods. Solutions of algebraic and transcendental equations.
(Offered yearly, Fall Quarter)

10.862 Numerical Analysis Prep. 10.861, Numerical Analysis
Approximation and interpolation. Use of difference techniques in interpolation and quadrature. Approximation by series of orthogonal functions; rational approximation. (Offered yearly, Winter Quarter)

10.863 Numerical Analysis Prep. 10.862, Numerical Analysis
Numerical solution of ordinary and partial difference equations, with emphasis on stability and accuracy of solutions. (Offered yearly, Spring Quarter)

10.865 Approximation Theory Prep. Advanced Calculus, Linear Algebra and Probability

10.866 Approximation Theory Prep. 10.865, Approximation Theory
The content of courses 10.865 and 10.866, Approximation Theory, is as follows:

Various techniques for the approximation of given functions, including interpolation, rational approximation, and orthogonal functions. Applications to such problems as numerical integration and solution of differential equations.

Credits: 4 quarter hours. (Offered yearly, Winter Quarter)

10.871 Matrix Analysis Prep. 10.802 and 10.804, Advanced Mathematics, or Linear Algebra and Advanced Calculus

Solutions of systems of linear equations by direct and iterative methods; matrix inversion, characteristic values, canonical forms.

(Offered 1968-69, Winter Quarter)

10.872 Matrix Analysis Prep. 10.871, Matrix Analysis
Discussion of Hermitian, orthogonal, and unitary matrices and their physical significance. Functions of matrices and matrix calculus.

(Offered 1968-69, Spring Quarter)

10.873 Matrix Analysis Prep. Linear Algebra and Advanced Calculus
This course, offered to day students, embodies the material in 10.871 and 10.872, Matrix Analysis.

Credits: 4 quarter hours. (Offered yearly, Fall Quarter)

10.876 Tensor Analysis Prep. 10.802 and 10.804, Advanced Mathematics or 10.823, Advanced Calculus or Equivalent

Tensor algebra; review of three-dimensional point and vector spaces in the setting of tensor analysis. Linear algebra and n-dimensional affine space. The coordinate tensor, tensor products, invariants, physical components.

(Offered Fall Quarter)

10.877 Tensor Analysis Prep. 10.876, Tensor Analysis
Symmetric and alternating tensors, rank and support, duality. The metric tensor. Tensor Calculus: curvilinear coordinates, tangent spaces.

(Offered Winter Quarter)

10.878 Tensor Analysis

Prep. 10.877, Tensor Analysis

Tensor fields, covariant derivative. Riemannian geometry, geodesics, curvature tensor. Parallel displacement, linear connections, exterior forms.

(Offered Spring Quarter)

10.901 General Topology

Prep. 10.823, Advanced Calculus or Equivalent

(Offered yearly, Fall Quarter)

10.902 General Topology

Prep. 10.901, General Topology

The following material is covered in 10.901 and 10.902, General Topology. Sets and maps, metric spaces, topological spaces, separation axioms, compactness, connectedness.

(Offered Summer Quarter)

10.905 Complex Analysis

Prep. Advanced Calculus

Analytic functions, conformal mapping, applications to fluid flow and electrostatic potential problems.

Credits: 4 quarter hours.

(Offered yearly, Fall Quarter)

10.906 Complex Analysis

Prep. 10.905, Complex Analysis

Integration; further topics in theory, including singularities and residues; and further applications.

Credits: 4 quarter hours.

(Offered yearly, Spring Quarter)

10.907 Algebraic Topology

Prep. 10.913, Theory of Functions

of a Real Variable and 10.924, Algebra, or Equivalent

Credits: 4 quarter hours.

(Offered yearly, Fall Quarter)

10.908 Algebraic Topology

Prep. 10.907, Algebraic Topology

The content of the above two courses is as follows: Homology groups, homology sequences, homotopy theory, fiber spaces, sheaves.

Credits: 4 quarter hours.

(Offered yearly, Winter Quarter)

10.909 Algebraic Topology

Prep. 10.908, Algebraic Topology

Products in homology and cohomology, Künneth theorems, cohomology algebra, Steenrod operations, Poincaré Duality, characteristic classes, higher homotopy groups and the Hurewicz Theorem.

Credits: 4 quarter hours.

(Offered in alternate years, Spring Quarter)

10.911 Theory of Functions of a Real Variable

Prep. 10.901,

General Topology

Lebesgue measure on real line, measurable functions, Lebesgue Integral, convergence theorems, bounded variation, absolute continuity.

(Offered yearly, Winter Quarter)

10.912 Theory of Functions of a Real Variable

Prep. 10.911,

Theory of Functions of a Real Variable

Classical Banach Spaces, integration theory on abstract measure spaces, signed measures, Radon-Nikodym Theorem, Product measure, Fubini Theorem.

(Offered yearly, Spring Quarter)

10.913 Theory of Functions of a Real Variable

Prep. Advanced Calculus

Sets, relations, Zorn's lemma. Metric and topological spaces. Continuous mappings. Product and quotient spaces. Hausdorff, compact and connected spaces.

Complete metric spaces; uniformly continuous mappings. Abstract integral and measure.

Credits: 4 quarter hours.

(Offered yearly, Fall Quarter)

10.914 Theory of Functions of a Real Variable

Prep. 10.913, Theory of

Functions of a Real Variable

Integrable and measurable functions. Product integral and Fubini's Theorem. Signed integrals; absolute continuity and the Radon-Nikodym Theorem; L^p spaces.

Credits: 4 quarter hours.

(Offered yearly, Winter and Spring Quarters)

10.915 Theory of Functions of a Complex Variable

Prep. 10.901,

General Topology

(may be taken concurrently)

Geometry of the complex plane, analytic functions, Cauchy's theorem.

(Offered yearly, Fall Quarter)

10.916 Theory of Functions of a Complex Variable

Prep. 10.915,

Theory of Functions of a Complex Variable

Infinite sequences and series, singularities, residues, applications.

(Offered yearly, Winter Quarter)

10.917 Theory of Functions of a Complex Variable

Prep. 10.913,

Theory of Functions of a Real Variable

This course, offered to day students, embodies the course content of 10.915 and 10.916, Theory of Functions of a Complex Variable.

Credits: 4 quarter hours.

(Offered yearly, Fall Quarter)

10.918 Theory of Functions of a Complex Variable

Prep. 10.916,

Theory of Functions of a Complex Variable

Meromorphic functions, Mittag-Leffler theorem, conformal mapping.

(Offered yearly, Spring Quarter)

10.919 Theory of Functions of a Complex Variable

Prep. 10.918,

Theory of Functions of a Complex Variable

Analytic continuation, Riemann surfaces, doubly periodic functions.

(Offered 1968-69, Fall Quarter)

10.920 Theory of Functions of a Complex Variable

Prep. 10.917,

Theory of Functions of a Complex Variable

This course, offered to day students, embodies the material in 10.918 and 10.919, Theory of Functions of a Complex Variable.

Credits: 4 quarter hours.

(Offered yearly, Winter Quarter)

10.921 Advanced Complex Functions

Prep. 10.920, Theory of

Functions of a Complex Variable

Advanced topics in the theory of functions of a complex variable.

Credits: 4 quarter hours.

(Offered in alternate years, Spring Quarter)

10.924 Algebra

Prep. One semester of Modern Algebra

Credits: 4 quarter hours

(Offered yearly, Fall Quarter)

10.925 Algebra Prep. 10.924, Algebra
Credits: 4 quarter hours. (Offered yearly, Winter Quarter)

10.926 Algebra Prep. 10.925, Algebra
The content of courses 10.924, 10.925, 10.926, Algebra is as follows: Group theory, Galois theory, unique factorization domains, Noetherian rings, modules, multilinear algebra.
Credits: 4 quarter hours. (Offered yearly, Spring Quarter)

10.930 Topics in Analysis Prep. 10.914, Theory of Functions of a Real Variable and Consent of the Instructor
Selected advanced topics in analysis.
Credits: 4 quarter hours. (Offered in alternate years, Spring Quarter)

10.931 Functional Analysis Prep. 10.914, Theory of Functions of a Real Variable
Credits: 4 quarter hours. (Offered yearly, Spring Quarter)

10.932 Functional Analysis Prep. 10.931, Functional Analysis
The content of courses 10.931, 10.932, Functional Analysis is as follows: Topological vector spaces, Banach spaces, Hilbert spaces, Banach algebras, algebras of operations; representations.
Credits: 4 quarter hours. (Offered in alternate years, Fall Quarter)

10.933 Ergodic Theory Prep. 10.914, Theory of Functions of a Real Variable
Credits: 4 quarter hours. (Offered in alternate years, Fall Quarter)

10.934 Ergodic Theory Prep. 10.933, Ergodic Theory
The content of courses 10.933, 10.934, Ergodic Theory is as follows: Measurable transformations. Ergodic theorems and their generalizations, classification of measure-preserving transformations, entropy and other isomorphism invariants.
Credits: 4 quarter hours. (Offered in alternate years, Winter Quarter)

10.935 Advanced Probability Theory Prep. 10.914, Theory of Functions of a Real Variable
Probability spaces, random variables, distribution functions and characteristic functions. Convergence and stability of sums of independent random variables. Central limit problem. Conditional expectation. Martingales.
Credits: 4 quarter hours. (Offered in alternate years, Fall Quarter)

10.936 Advanced Stochastic Processes Prep. 10.935, Advanced Probability Theory
Random walk: classification and limit properties. Hitting probabilities, Markov processes, strong Markov processes, Markov semigroups, sample continuity and diffusion operators.
Credits: 4 quarter hours. (Offered in alternate years, Winter Quarter)

10.937 Advanced Mathematical Statistics Prep. 10.914, Theory of Functions of a Real Variable
Parametric and nonparametric methods in statistics, with some emphasis on

statistical analysis of linear models.

Credits: 4 quarter hours. (Offered in alternate years, Winter Quarter)

10.941 Functions of Several Complex Variables Prep. 10.920,
Theory of Functions of a Complex Variable and
10.908, Algebraic Topology

Credits: 4 quarter hours (Offered in alternate years, Winter Quarter)

10.942 Functions of Several Complex Variables Prep. 10.941,
Functions of Several Complex Variables

The content of courses 10.941 and 10.942, Functions of Several Complex Variables is as follows: Holomorphic functions, topology of the space of holomorphic functions, holomorphy domains, Levi convexity theory.

Credits: 4 quarter hours. (Offered in alternate years, Spring Quarter)

10.946 Mathematical Control Theory Prep. 10.914, Theory of
Functions of a Real Variable and
10.931, Functional Analysis

Ordinary and relaxed variational problems. Existence of relaxed minima. Approximation of relaxed controls with ordinary controls. Necessary conditions for minimum. Functions of controls.

Credits: 4 quarter hours. (Offered in alternate years, Winter Quarter)

10.947 Mathematical Control Theory Prep. 10.946,
Mathematical Control Theory or
Consent of the Instructor

Unilateral and minimax problems.

Credits: 4 quarter hours. (Offered in alternate years, Spring Quarter)

10.951 Finite Groups Prep. 10.926, Algebra

Credits: 4 quarter hours. (Offered in alternate years, Fall Quarter)

10.952 Finite Groups Prep. 10.951, Finite Groups

The content of courses 10.951 and 10.952, Finite Groups is as follows: Theory of solvable and nilpotent groups, permutation groups, transfer, p groups, representations of groups, group characters.

Credits: 4 quarter hours. (Offered in alternate years, Winter Quarter)

10.953 Lie Algebras Prep. 10.952, Finite Groups

The structure of semi-simple complex Lie algebras.

Credits: 4 quarter hours. (Offered in alternate years, Fall Quarter)

10.954 Theory of Rings Prep. 10.926, Algebra

Rings with minimal condition, simple rings, Webberburn theorem, representation of rings.

Credits: 4 quarter hours. (Offered in alternate years, Spring Quarter)

10.955 Advanced Lie Algebras Prep. 10.953, Lie Algebras

Credits: 4 quarter hours. (Offered in alternate years, Winter Quarter)

10.956 Advanced Lie Algebras

Prep. 10.955, Advanced Lie Algebras

The content of courses 10.955 and 10.956 is as follows: Advanced topics in the Theory of Lie Algebras.

Credits: 4 quarter hours.

(Offered in alternate years, Spring Quarter)

10.960 Homological Algebra

Prep. 10.926, Algebra

Topics in homology such as modules, diagrams, functors, complexes, extensions, Ext, Tor, Hom, and the cohomology theory of groups.

Credits: 4 quarter hours.

(Offered in alternate years, Winter Quarter)

10.963 Algebraic Number Theory

Prep. 10.926, Algebra and
10.917, Theory of Functions of
a Complex Variable

(Global) Algebraic number theory: Dirichlet unit theorem, finiteness of the ideal class group, geometry of numbers.

Credits: 4 quarter hours.

(Offered in alternate years, Fall Quarter)

10.964 Analytic Number Theory

Prep. 10.963, Algebraic Number Theory

Analytic formulas, functional equations, Dirichlet, Hecke and Artin L-series.

Credits: 4 quarter hours.

(Offered in alternate years, Winter Quarter)

10.970 Lie Groups

Prep. 10.913, Theory of Functions of a Real Variable

Analytic manifolds, infinitesimal transformations and differential forms, topological groups, local groups, Lie groups, Lie algebra of a Lie group, exponential mapping, algebra of differential forms, Lie's fundamental theorems, homomorphisms, universal covering group.

Credits: 4 quarter hours.

(Offered in alternate years, Spring Quarter)

10.973 Topological Vector Spaces

Prep. 10.914, Theory of
Functions of a Real Variable

Complete metrizable topological vector spaces; Banach-Steinhaus theorem; open mapping theorem. Locally convex topological vector spaces; Hahn-Banach theorem. Duality, weakened topologies. Spaces of continuous linear mappings. Criteria of compactness.

Credits: 4 quarter hours.

(Offered in alternate years, Winter Quarter)

10.976 Differentiable and Analytic Manifolds

Prep. 10.920, Theory of
Functions of a Complex Variable and
10.908, Algebraic Topology

Real and complex manifolds, tangent spaces, differential forms, integration.

Credits: 4 quarter hours.

(Offered in alternate years, Spring Quarter)

10.977 Real and Complex Manifolds

Prep. 10.976, Differentiable and
Analytic Manifolds or
Consent of the Instructor

Multilinear algebra, elementary differential geometry, vector bundles, pre-sheaves, sheaves.

Credits: 4 quarter hours.

(Offered in alternate years, Winter Quarter)

10.978 Real and Complex Manifolds

Prep. 10.977, Real and
Complex Manifolds

Cech cohomology; De Rahm theorem; Riemannian, Hermitian and Kählerian
metrics; differential operators.

Credits: 4 quarter hours. (Offered in alternate years, Spring Quarter)

10.990 Seminar

Prep. Consent of the Department

Investigation of selected topics through the study of journal articles.

(Offered in alternate years, Fall Quarter)

10.992 Readings in Analysis

Prep. Consent of the Department

Supervised reading in selected topics in analysis.

Credits: 4 quarter hours. (Offered yearly, every quarter)

10.993 Readings in Algebra

Prep. Consent of the Department

Supervised reading in selected topics in algebra.

Credits: 4 quarter hours. (Offered yearly, every quarter)

10.994 Readings in Topology

Prep. Consent of the Department

Supervised reading in selected topics in topology.

Credits: 4 quarter hours. (Offered yearly, every quarter)

10.995 Doctoral Thesis

Prep. Admission to Ph.D. Program
(Offered yearly, every quarter)

Physics

Professors

Reginald G. Lacount, S.B., M.A.,
Ph.D., Chairman
Richard Arnowitt, B.S., M.S., Ph.D.
Marvin Friedman, B.S., Ph.D.
Walter Hauser, B.S., Ph.D.
Giovanni Lanza, Ph.D.
Elliott H. Lieb, B.S., Ph.D.
Bertram J. Malenka, A.B., A.M.,
Ph.D.
Carl Shiffman, B.Sc., Ph.D.
Thomas Wallace, B.S., M.A., Ph.D.
Roy Weinstein, S.B., Ph.D.

Associate Professors

Ronald Aaron, A.B., Ph.D.
Jonas Alster, Ph.D.
Alan Cromer, B.S., Ph.D.
Marvin Gettner, B.S., Ph.D.
Michael Glaubman, M.S., Ph.D.
Richard Grojean, B.S., M.S.
Eugene Saletan, B.A., M.A., Ph.D.
Yogi Srivastava, B.Sc., M.Sc., Ph.D.
Michael Vaughan, A.B., Ph.D.
Eberhard von Goeler, Ph.D.

Assistant Professors

Hyman Goldberg, B.Sc., Ph.D.
Bernard Gottschalk, B.S., Ph.D.

Donald Kobe, B.S., M.S., Ph.D.
Gerhard Lutz, B.S., M.S., Ph.D.
Pran Nath, M.Sc., Ph.D.
James Neighbor, B.S., S.M., Ph.D.
Yitzhak Sharon, A.B., Ph.D.
Hans von Briesen, Jr., B.S., Ph.D.
Morton Wiess, B.S., Ph.D.
Fa Yueh Wu, B.S., M.S., Ph.D.

Lecturers

Beverly C. Dunn, Jr., B.A., M.A., Ph.D.
Leonard J. Eyges, B.S., M.S., Ph.D.
Owen Fleischman, B.S., Ph.D.
William S. Hellman, B.S., M.S., Ph.D.
Irving Lessin, B.A., Ph.D.
Michael A. Martinelli, B.S., Ph.D.
Ernest E. Pittelli, B.S., Ph.D.
John J. Stachel, B.S., M.S., Ph.D.
Clarence O. Thornburg, B.S., Ph.D.

Instructors

Lloyd Kannenberg, B.A., M.S., Ph.D.
Alan Widom, B.S., Ph.D.

Post Doctoral Research Associates

William Faissler, B.A., Ph.D.
Edward Martens, B.S., Ph.D.
Ronald Parsons, B.A., Ph.D.

Admission

To be enrolled for graduate work in physics, applicants must have obtained a bachelor's degree from a recognized institution with an undergraduate program which included 12 semester hours of physics beyond general physics, and mathematics through differential equations.

THE MASTER'S DEGREE

Program

Forty-two quarter hours of academic credit are required. The registration of full-time students will be approved by a faculty advisor. If deficiencies in the student's background exists, registration in advanced undergraduate courses may be required.

A thesis option is available for a full-time student with the approval of the department. If approved, a thesis carries six quarter hours of credit.

The program may be completed on a part-time evening basis, and the student may progress according to his ability and time available.

All students will be required to successfully complete the required courses as listed below. The remainder of the program may be satisfied by taking elective courses.

	Credits
Mathematical Physics	
11.811, 11.812, and 11.813 or 11.814 and 11.815	6
Classical Mechanics	
11.821, 11.822, and 11.823 or 11.824 and 11.826	6
Electromagnetic Theory	
11.831, 11.832, and 11.833 or 11.834 and 11.835	6
Quantum Theory	
11.841, 11.842, and 11.843	12
	<hr/> 30

Electives

In addition to these 30 quarter hours of required courses, 12 more quarter hours must be taken. These may be elected from any course in physics, mathematics, engineering, or biology, for which the student has the necessary preparation.

THE DOCTOR OF PHILOSOPHY DEGREE

The following material outlines the procedure for admission to the doctoral program and the steps necessary to qualify for the Ph.D. degree. For further information applicants should write to the Chairman of the Department of Physics.

Admission

Students admitted to full-time study in physics are eligible to take the qualifying examination in accordance with the information given under the heading of Qualifying Examination.

Students enrolled in the evening part-time master's degree program, who wish to qualify for Ph.D. candidacy, may so indicate by petition to the Graduate Committee of the Physics Department. The petition should

be a letter containing a timetable for the taking of qualifying examinations and a course plan for completing 42 quarter hours of graduate study.

Residence Requirements

After a student has completed 42 quarter hours of course work and has passed his qualifying examination, he becomes a doctoral degree candidate and must satisfy the residence requirement by one full year of full-time graduate work.

Degree Candidacy

Degree candidacy is established in accordance with the general Graduate Division regulations.

Qualifying Examination

The Qualifying Examination consists of a written and an oral part. Only students with an adequate score on the written examination will be permitted to take the oral. The written part covers the fields of mechanics, electricity and magnetism, modern physics, optics, and thermodynamics. These examinations are given twice a year, once in October and once in February. All students must take these examinations by the fourth quarter of their registration for graduate work. If the examination is failed, the student is allowed to repeat the examination the next time it is given, no later than the sixth quarter. A student entering with 15 semester hours or more of graduate work taken in some other institution must take the qualifying examination in his first quarter of registration. If the examination is failed, the student may repeat it the next time it is given. All students intending to take the Qualifying Examination should notify the Department by the middle of September or the first of February. No student will be permitted to continue his work toward a Ph.D. who has not passed the qualifying examination by the end of his second year at Northeastern (by the end of the first year for transfer students with 15 semester hours). Copies of past qualifying examinations are kept in the Physics Library.

Comprehensive Examination

The comprehensive examination consists of a written and an oral part. Only students with an adequate score on the written examination will be permitted to take the oral. The written part lasts two days. The first day covers the fields of classical mechanics, quantum mechanics, and electro-magnetic theory. On the second day, students select questions from the fields of thermodynamics, statistical mechanics, plasma physics, nuclear physics, elementary particles, solid state, and special relativity. Some of these questions will be based on recent departmental colloquia. These examinations are given twice a year, once in October and once in February. A student must satisfy the language requirements for one

foreign language before he may take the comprehensive. Copies of past comprehensive examinations are kept in the Physics Library.

A student must take these examinations during the next fall quarter following the quarter in which he passed the qualifying examination. If the examination is failed, it may be repeated the next time it is given. No student will be permitted to continue his graduate program who has not passed the comprehensive examination by the end of the first academic year following the year in which he passed the qualifying examination.

Exceptions of these rules may be made under very unusual circumstances. A written request should be sent to the Department Chairman and will be acted on by the Departmental Graduate Committee.

Course Requirements

The course requirements, in addition to the minimum requirement of forty-two quarter hours credit, are established by the Departmental Graduate Committee for each candidate.

Thesis

The student should have made arrangements for a thesis adviser by the time he wishes to take the oral part of the comprehensive examination. An outline of the thesis must be approved by the Departmental Graduate Committee at least eight months before the final oral examination.

Details of the method of obtaining a thesis adviser and of the procedure for submitting the outline will be given to the student by the department.

Language Requirements

Competence must be demonstrated in two foreign languages, at least one of which is chosen from among French, German, and Russian. Competence in one language will be assured if that language was studied for a year or more and passed in college or if it is the candidate's native language, but competence in one language from among French, German, and Russian must be demonstrated by passing an examination as specified by the Departmental Language Committee. Competence in one language must be demonstrated before the comprehensive examination is taken.

Final Oral Examination

This examination will be held in accordance with the Graduate Division regulations.

DESCRIPTION OF COURSES

- | | | |
|---|--|--|
| 11.801 | Introductory Modern Physics I | Prep. Admission to Science or Engineering Graduate Program
(Offered yearly, Fall Quarter) |
| Credits: 2 quarter hours. | | |
| 11.802 | Introductory Modern Physics II | Prep. 11.801, Introductory Modern Physics I
(Offered yearly, Winter Quarter) |
| Credits: 2 quarter hours. | | |
| 11.803 | Introductory Modern Physics III | Prep. 11.802, Introductory Modern Physics II |
| <p>The courses in Introductory Modern Physics carry graduate credit, but may not be used in satisfying the stated requirements for the master's degree in physics. The content of the above three courses is a study of the breakdowns of the classical laws of physics, review of important twentieth-century experiments showing the quantum aspects of radiation and matter, introduction to special relativity, the discovery of the electron, the nuclear atom, the radiation paradox, the Bohr theory of hydrogen and the inner shells of heavy atoms, wave aspects of matter, and Schroedinger's wave mechanics.</p> | | |
| Credits: 2 quarter hours. (Offered yearly, Spring Quarter) | | |
| 11.811 | Mathematical Physics | Prep. Admission to Science or Engineering Graduate Program
(Offered yearly, Fall Quarter) |
| Credits: 2 quarter hours. | | |
| 11.812 | Mathematical Physics | Prep. 11.811, Mathematical Physics
(Offered yearly, Winter Quarter) |
| Credits: 2 quarter hours. | | |
| 11.813 | Mathematical Physics | Prep. 11.812, Mathematical Physics |
| <p>The content of the above three courses is an introduction to mathematical methods of theoretical physics. Topics to be covered include vector spaces, eigenfunction expansions, special functions of mathematical physics, theory of functions of a complex variable, differential and integral equations, generalized functions, Green's functions, partial differential equations, perturbation theory, and selected applications.</p> | | |
| Credits: 2 quarter hours. (Offered yearly, Spring Quarter) | | |
| 11.814 | Mathematical Physics | Prep. Admission to Science or Engineering Graduate Program
(Offered yearly, Fall Quarter) |
| Credits: 4 quarter hours. | | |
| 11.815 | Mathematical Physics | Prep. 11.814, Mathematical Physics |
| <p>These two courses cover essentially the same material as 11.811, 11.812, and 11.813, Mathematical Physics.</p> | | |
| Credits: 3 quarter hours. (Offered yearly, Winter Quarter) | | |
| 11.821 | Classical Mechanics | Prep. Admission to Science or Engineering Graduate Program
(Offered yearly, Fall Quarter) |
| Credits: 2 quarter hours. | | |
| 11.822 | Classical Mechanics | Prep. 11.821, Classical Mechanics
(Offered yearly, Winter Quarter) |
| Credits: 2 quarter hours. | | |

11.823 Classical Mechanics

Prep. 11.822, Classical Mechanics

The content of the above three courses is Newton's laws of motion, constraints and D'Alembert's principles, Lagrange's equations, Hamilton's variational principle, central force motion, Hamilton's canonical equations, coupled oscillations, rigid body motion, Hamiltonian formulation of mechanics, canonical transformations, Hamilton-Jacobi theory, action-angle variables, classical perturbation theory.

Credits: 2 quarter hours.

(Offered yearly, Spring Quarter)

11.824 Classical Mechanics

Prep. Admission to Science or Engineering Graduate Program

Credits: 3 quarter hours.

(Offered yearly, Fall Quarter)

11.826 Classical Mechanics

Prep. 11.824, Classical Mechanics

The content of the above two courses is essentially the same as 11.821, 11.822, 11.823, Classical Mechanics.

Credits: 3 quarter hours.

(Offered yearly, Spring Quarter)

11.827 Statistical MechanicsPrep. 11.843, Quantum Theory III
(may be taken concurrently)

Credits: 3 quarter hours.

(Offered 1968-69, Fall Quarter)

11.828 Statistical MechanicsPrep. 11.827, Statistical Mechanics
(Offered 1968-69, Winter Quarter)

Credits: 3 quarter hours.

11.829 Statistical Mechanics

Prep. 11.828, Statistical Mechanics

The content of the above three courses is a study of the basics of thermodynamics, density matrix and partition function for the canonical and grand canonical ensembles and their connection with thermodynamic functions, application to specific examples, fluctuations, and irreversible processes.

Credits: 3 quarter hours.

(Offered 1968-69, Spring Quarter)

11.831 Electromagnetic Theory

Prep. Admission to Science or Engineering Graduate Program

Credits: 2 quarter hours.

(Offered yearly, Fall Quarter)

11.832 Electromagnetic TheoryPrep. 11.831, Electromagnetic Theory
(Offered yearly, Winter Quarter)

Credits: 2 quarter hours.

11.833 Electromagnetic Theory

Prep. 11.832, Electromagnetic Theory

The content of the above three courses is electrostatics, boundary value problems, Green's functions and orthogonal function expansion, electrostatics of dielectric media, magnetostatics, time varying fields, Maxwell's equations, energy and momentum of the electromagnetic field, boundary conditions, plane waves, Fourier analysis, radiation of electromagnetic waves.

Credits: 2 quarter hours.

(Offered yearly, Spring Quarter)

11.834 Electromagnetic Theory

Prep. Admission to Science or Engineering Graduate Program

Credits: 3 quarter hours.

(Offered yearly, Fall Quarter)

- 11.835 Electromagnetic Theory** Prep. 11.834, Electromagnetic Theory
The content of the above two courses is the same as 11.831, 11.832, 11.833, Electromagnetic Theory.
Credits: 3 quarter hours. (Offered yearly, Winter Quarter)
- 11.836 Electromagnetic Theory** Prep. 11.835, Electromagnetic Theory
Irreducible multipole expansion of the electromagnetic field; introduction to special relativity, radiation from high-speed particles.
Credits: 3 quarter hours. (Offered yearly, Spring Quarter)
- 11.837 Electromagnetic Theory** Prep. 11.836, Electromagnetic Theory
Advanced topics in electromagnetic theory such as problems involving radiation reaction, energy, momentum and the equations of motion of a high-speed particle, Cerenkov radiation, the Lagrangian and Hamiltonian formulation of electrodynamics.
Credits: 3 quarter hours. (Offered 1968-69, Fall Quarter)
- 11.838 General Relativity I** Prep. 11.837, Electromagnetic Theory and 11.823 or 11.826, Classical Mechanics
Credits: 3 quarter hours. (Offered 1968-69, Winter Quarter)
- 11.839 General Relativity II** Prep. 11.838, General Relativity I
The content of the above two courses is a brief survey of differential geometry, physical basis of the Einstein equations, simple solutions and experimental tests, cosmology, asymptotic properties of the Einstein equations (radiation, energy, momentum), quantization of the theory.
Credits: 3 quarter hours. (Offered 1968-69, Spring Quarter)
- 11.841 Quantum Theory I** Prep. 11.821 or 11.824, Classical Mechanics and 11.813 or 11.815, Mathematical Physics
(may be taken concurrently)
Experimental basis of quantum theory, Schrodinger equations and probability interpretation. Uncertainty principle, one dimensional problems, operator methods for harmonic oscillator, orbital angular momentum, central force problem.
Credits: 4 quarter hours. (Offered yearly, Fall and Winter Quarters)
- 11.842 Quantum Theory II** Prep. 11.841, Quantum Theory I and 11.823 or 11.826, Classical Mechanics
(may be taken concurrently)
Scattering problems, Born approximation, plane wave analysis, introduction to S-matrix theory, general vector space formulation of quantum mechanics.
Credits: 4 quarter hours. (Offered yearly, Winter and Spring Quarters)
- 11.843 Quantum Theory III** Prep. 11.842, Quantum Theory II
Time independent perturbation theory (non-degenerate and degenerate), time dependent perturbation theory, semi-classical theory of radiation, Pauli wave equation.
Credits: 4 quarter hours. (Offered yearly, Fall and Spring Quarters)
- 11.844 Quantum Theory IV** Prep. 11.843, Quantum Theory III
Credits: 3 quarter hours. (Offered yearly, Winter Quarter)

11.845 Quantum Theory V

Prep. 11.844, Quantum Theory IV

The above two courses provide a study of the special topics in nonrelativistic and relativistic quantum mechanics, Dirac wave equations, addition of angular momentum problems.

Credits: 3 quarter hours.

(Offered yearly, Spring Quarter)

11.851 Plasma Physics I

Prep. 11.832, Electromagnetic Theory

Motion of charged particles in electromagnetic fields, propagation of electromagnetic waves in ionized gases, elementary theory of plasma, Boltzmann equation for plasma, fundamentals of magnetohydrodynamics.

Credits: 2 quarter hours.

(Offered 1969-70, Fall Quarter)

11.852 Plasma Physics II

Prep. 11.851, Plasma Physics I

Application of MHD to plasma confinement, motions of plasma across and along magnetic lines of force, plasma oscillations, waves in magnetoplasma, dispersion relations, nonlinearities in plasma.

Credits: 2 quarter hours.

(Offered 1969-70, Winter Quarter)

11.853 Plasma Physics III

Prep. 11.852, Plasma Physics II

Fokker-Planck equations for plasma, plasma conductivity, run-away electrons, relaxation times, radiation from plasma, stability theories, relativistic plasma.

Credits: 2 quarter hours.

(Offered 1969-70, Spring Quarter)

11.861 Introductory Nuclear Physics I

Prep. A one-year

(undergraduate) course in modern
(atomic and nuclear) physics

Basic description of nuclei, radioactivity, nuclear detectors.

Credits: 2 quarter hours.

(Offered yearly, Fall Quarter)

11.862 Introductory Nuclear Physics IIPrep. 11.861, Introductory
Nuclear Physics I

Static properties of nuclei, nuclear models, nuclear transitions.

Credits: 2 quarter hours.

(Offered yearly, Winter Quarter)

11.863 Introductory Nuclear Physics IIIPrep. 11.862, Introductory
Nuclear Physics II

Nuclear reactions, high-energy physics, elementary particles.

Credits: 2 quarter hours.

(Offered yearly, Spring Quarter)

11.864 Theoretical Nuclear Physics IPrep. 11.843, Quantum Theory III
(may be taken concurrently)

Theoretical interpretation of the experimental data concerning the nucleon-nucleon interaction. Topics such as the variety of nucleon-nucleon scattering experiments, phase shift analysis, potential and other phenomenological models, and meson theory will be discussed.

Credits: 3 quarter hours.

(Offered 1969-70, Fall Quarter)

11.865 Theoretical Nuclear Physics IIPrep. 11.864, Theoretical
Nuclear Physics I

Nuclear models. The shell model, the collective model and the optical model will be considered.

Credits: 3 quarter hours.

(Offered 1969-70, Winter Quarter)

- 11.866 Theoretical Nuclear Physics III** Prep. 11.865, Theoretical Nuclear Physics II
Special topics which may vary from year to year, such as beta-decay, nuclear reactions, electromagnetic interactions with nuclei and high energy scattering phenomena.
Credits: 3 quarter hours. (Offered 1969-70, Spring Quarter)
- 11.871 Introductory Solid-State Physics I** Prep. A one year (undergraduate) course in modern (atomic and nuclear) physics
An introduction to the electrical and magnetic properties of matter.
Credits: 2 quarter hours. (Offered yearly, Fall Quarter)
- 11.872 Introductory Solid-State Physics II** Prep. 11.871, Introductory Solid-State Physics I
A continuation of the electrical and magnetic properties plus the optical properties of matter.
Credits: 2 quarter hours. (Offered yearly, Winter Quarter)
- 11.873 Introductory Solid-State Physics III** Prep. 11.872, Introductory Solid-State Physics II
The thermal properties of matter.
Credits: 2 quarter hours. (Offered yearly, Spring Quarter)
- 11.874 Solid-State Physics I** Prep. 11.843, Quantum Theory III (may be taken concurrently)
Selected topic in the quantum theory of solids. The band theory of metals.
Credits: 3 quarter hours. (Offered yearly, Fall Quarter)
- 11.875 Solid-State Physics II** Prep. 11.874, Solid-State Physics I
A continuation of the band theory of metals plus semi-conduction and ionic crystals.
Credits: 3 quarter hours. (Offered yearly, Winter Quarter)
- 11.876 Solid-State Physics III** Prep. 11.875, Solid-State Physics II
Electric, magnetic and thermal properties of matter.
Credits: 3 quarter hours. (Offered yearly, Spring Quarter)
- 11.881 Quantum Theory of Fields I** Prep. 11.836, Electromagnetic Theory and 11.844, Quantum Theory IV (may be taken concurrently)
Credits: 3 quarter hours. (Offered 1969-70, Winter Quarter)
- 11.882 Quantum Theory of Fields II** Prep. 11.881, Quantum Theory of Fields I and 11.845, Quantum Theory V (may be taken concurrently)
Credits: 3 quarter hours. (Offered 1969-70, Spring Quarter)
- 11.883 Quantum Theory of Fields III** Prep. 11.882, Quantum Theory of Fields II
The content of the above three courses provide a study of the quantum mechanical one-particle wave equations for electrons, nucleons, neutrinos and mesons, symmetric and antisymmetric multiparticle systems, second quantization, free

relativistic boson fields, fermion fields and electromagnetic fields, relation to the description of various elementary particles, theory of interacting fields and particles, formal scattering theory, Feynman diagrams, renormalization procedures, application to scattering, production and decay phenomena, quantum electrodynamic effects, recent formal developments.

Credits: 3 quarter hours. (Offered 1968-69, Fall Quarter)

11.884 Particle Physics I

Prep. 11.845, Quantum Theory V
(may be taken concurrently)

Credits: 3 quarter hours. (Offered 1968-69, Winter Quarter)

11.885 Particle Physics II

Prep. 11.884, Particle Physics I
(Offered 1968-69, Spring Quarter)

Credits: 3 quarter hours.

11.886 Particle Physics III

Prep. 11.885, Particle Physics II

The content of the above three courses is a discussion of the properties of baryons, meson, leptons, and resonant states. The general phenomenological framework of the fundamental interaction between elementary particles. The implication of relativistic covariance, unitarity, analyticity, invariance and conservation laws. (Some knowledge of elementary quantum field theory is desirable but not required.)

Credits: 3 quarter hours. (Offered 1969-70, Fall Quarter)

11.887 Many-Body Problems I

Prep. 11.843, Quantum Theory III
11.827 Statistical Mechanics
(may be taken concurrently)
(Offered 1969-70, Fall Quarter)

11.888 Many-Body Problems II

Prep. 11.887, Many-Body Problems I
11.828, Statistical Mechanics
(Offered 1969-70, Winter Quarter)

11.889 Many-Body Problems III

Prep. 11.888, Many-Body Problems II
(Offered 1969-70, Spring Quarter)

The above three courses provide an introduction to some many body problems and the mathematical techniques used in dealing with them. The following topics are discussed: Occupation-number formalism. The statistical mechanics of ideal gases. Theory of linear response and correlation functions and their relationship. Hartree-Fock and Random phase approximations. Landau theory of Fermi liquids. Applications to solid-state problems. Superconductivity. Superfluidity. Introduction to the method of Green's functions.

11.990 Special Topics in Physics

Prep. Consent of the instructor

A discussion of special topics in physics to be chosen by the instructor.

Credits: from 1 to 4 quarter hours. (Offered yearly)

11.991 Master's Thesis

Experimental and theoretical work for master's degree.

Credits: 6 quarter hours. (Offered yearly)

11.992 Special Problems in Physics

Prep. Consent of faculty member

Theoretical or experimental work under individual faculty supervision.

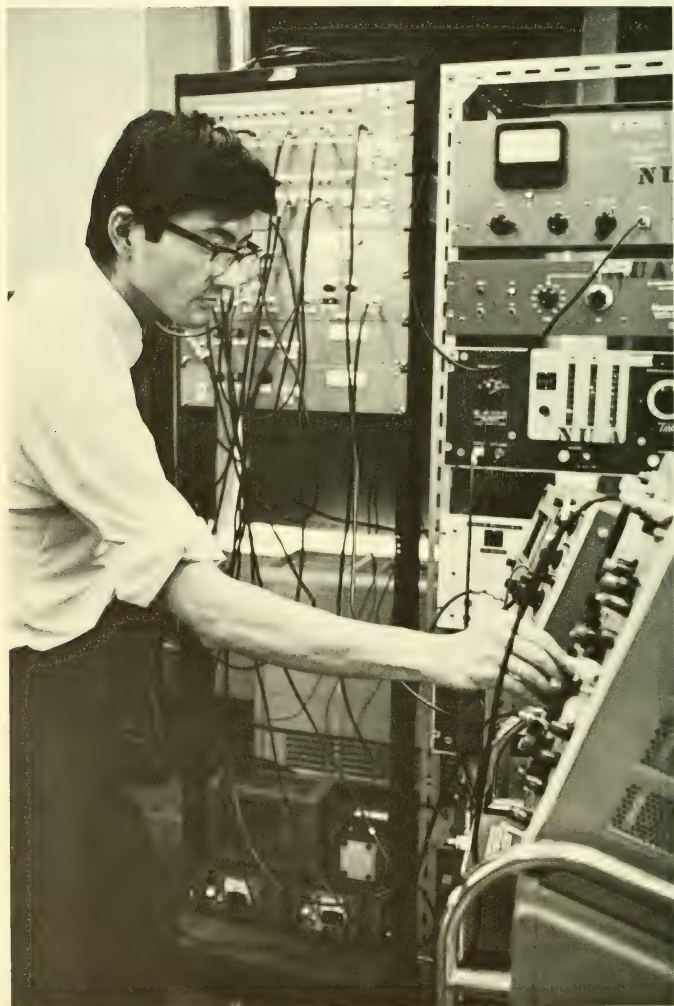
Credits: from 1 to 4 quarter hours. (Offered yearly)

11.995 Doctoral Thesis

Prep. Admission to Ph.D. program

Experimental and theoretical work for Ph.D. candidates.

(Offered yearly)



Political Science

Professors

R. Gregg Wilfong, A.B., M.A.,
Ph.D., Chairman
David W. Barkley, A.B., M.A.,
M.P.A., Ph.D.

Associate Professors

L. Gerald Bursey, B.A., A.M., Ph.D.
Steve Worth, B.S., Ph.D.

Assistant Professors

Minton F. Goldman, B.A., M.A.,
M.A.L.D., Ph.D.
Edwin D. Palmer, A.B., M.P.A.

Lecturers

Joseph F. Courtney, B.A., M.A., LI.B.

Admission

To be enrolled for graduate work in political science, applicants must have obtained a bachelor's degree from a recognized institution with an undergraduate program which included at least 15 semester hours of political science or government courses.

THE MASTER'S DEGREE

Program

Forty-two quarter hour credits of academic work are required. With the approval of the faculty adviser, a maximum of nine quarter hours may be elected from graduate courses in other departments and a maximum of eight quarter hours may be elected from advanced undergraduate courses.

A thesis is optional with the approval of the chairman of the department. If approved, a thesis carries six quarter hours of credit.

Comprehensive Examination

This examination will be held in accordance with the general Graduate Division regulations. Two major fields of political science will be covered as directed by the Departmental Committee on Graduate Studies.

Language or Statistics Requirement

In accordance with the general Graduate Division regulations, proficiency must be demonstrated in a foreign language, or in statistics, to be approved by the department.

DESCRIPTION OF COURSES

All courses carry three quarter hour credits unless otherwise specified.

22.800 Seminar in American Government

Analysis in depth of selected problems in American Government. Examples of problems are: transition of American Political Parties, legislative reapportionments, and the decline of Congress as a law-making body.

22.820 Federal Legislative Process

Study of Congress and of the influence of President, administrative bureaucracy, parties, interest groups, and public opinion on the development of legislative policy.

22.824 The Presidency

Examination of the place and function of the chief executive in the formulation and execution of public policy.

22.828 The Judiciary

Analysis of the role of the judiciary in the American governmental process. Special attention is given to those areas of constitutional law where the Court's decisions have a profound impact on the basic structure of American politics: (apportionment, economic regulation, federalism, etc.)

22.830 Civil Rights

Examination of the doctrine of Constitutionalism illustrated and amplified by a study of the substance and process of the Bill of Rights as developed in decisions of Federal courts, and Congressional enactments.

22.832 Intergovernmental Relations

An institutional-behavioral analysis of the changing relationship between the various levels of American government — national, state and local — relating the pattern of change to the social and economic forces which underlie it.

22.840 Problems in State Government

Appraisal of the problems of contemporary state government in the U.S. Particular emphasis is given to the state government of Massachusetts. Individual research is stressed.

22.844 Urban Government

The contemporary crisis in urban government — problems of political independence, government finance and administration, rapid growth of suburban and metropolitan areas, and decline and decay of the core city are stressed. Particular emphasis is given to the Boston metropolitan area. Individual research is stressed.

22.845 Seminar in Problems of Municipal Administration

Selected case problems and topics in municipal administration; including organization, financial management, personnel and labor relations, municipal services, and public and political relations. Individual research is stressed.

22.846 Seminar in Problems of Regional and Urban Development

An examination of the role of government and politics in the planning, programming, and administration of regional and urban development in the United States. Consideration is given to urban renewal; inter-urban and inter-regional competition; interstate compacts; public authorities; T.V.A., Appalachia, and New England regional development; anti-poverty programs; and conflicts between public and private interests. Individual research is stressed.

22.850 Seminar: Comparative Politics I

Comparative analysis of politics and political systems with special attention to fundamental problems of theory and practice. The chief focus is on contemporary political systems and contemporary theories in the field of comparative politics. Traditional models are also treated, but more briefly. Particular attention will be paid to British and American political experience.

22.851 Seminar: Comparative Politics II

Prep. 22.850, Seminar:
Comparative Politics I

Extends and intensifies the comparative analysis of politics undertaken in Comparative Politics I by examining a broader range of institutional experience. Special attention will be given to European political experience, particularly that of France and Germany.

22.854 Seminar: Totalitarianism

An analysis of totalitarianism and dictatorship, including study of historical background, fundamental characteristics, theories of origin, nature, and significance, and evaluation of techniques, ideologies, policies, and instruments of power. Special attention will be given to the government and politics of the Soviet Union.

22.880 Seminar in Public Administration

Selected topics in public administration with special emphasis upon the problems of relating politics and administration in the development of public policy.

22.882 Public Personnel Administration

Technique, practice and organization of personnel functions in public administration, including recruitment, compensation, training, discipline and relations with employee organizations.

22.884 Comparative Metropolitan Government and Politics

An examination of structure, administration and politics of selected major European cities in the context of the metropolitan problem in the United States, with special emphasis on problem solution and comparative administration.

22.888 Seminar in Administrative Law

Study of rule-making, adjudication (formal and informal), administrative finality and judicial review, administrative procedure, scope of administrative powers, and enforcement techniques.

22.900 Ancient and Medieval Political Thought

The development of political thought from Greek antiquity to the end of the Middle Ages. Both historical and analytical approaches will be utilized. Attention is also paid to the cultural, social, and intellectual context within which political theories develop.

22.910 Modern Political Thought

Examination of political thought from Machiavelli to Marx.

22.920 Contemporary Political Theory

The main currents of political thought in the latter half of the nineteenth and the twentieth centuries with special emphasis on the relations between political theory, philosophy and political science.

22.926 Seminar in American Political Thought

Examination of selected intellectual movements that have informed and influenced American political life.

22.944 Seminar in Nationalism

The evolution and role of nationalism in both theory and practice. Representative nationalistic movements and theories are analyzed.

22.946 Seminar: The Politics of Revolution and Change

Analysis of the nature of political change with attention to both theory and practice. Topics discussed are revolution, major trends in contemporary politics, and the relationship between political change and technological, scientific, or social change.

22.948 Government and Politics of North Africa and the Middle East

Comparative analysis of the political systems and foreign policies of African states north of the Sahara. Also stressed is the relationship of this area with the Middle East.

22.950 United States-Soviet Relations

The relations between the United States and the Soviet Union from 1917 to the present. Topics stressed are: the "non recognition" period, the breakdown of the World War II "Grand Alliance," and the nature of the present power conflict.

22.952 Communist China's Foreign Policy

A study of the Peking government's relations with Afro-Asia, the Soviet orbit, and the West. Attention is given to policy objectives, strategy, tactics, and the method of decision-making in both the party and state apparatus.

22.954 Soviet Relations with Eastern Europe

An analysis of Soviet policy in Eastern Europe, especially Russian efforts after World War II to develop Communism and maintain a position of pre-eminence in this region.

22.956 Government and Politics in Sub-Saharan Africa

Comparative analysis of the political systems and foreign policies of selected African states south of the Sahara. Special attention is given to the Republic of South Africa and its policy of apartheid.

22.958 The Formulation and Conduct of American Foreign Policy

The governmental mechanism for foreign policy formulation and its conduct. Problems in decision-making and execution are emphasized.

22.959 Seminar in American Foreign Policy

Examination in depth of selected issues concerning the role of the United States in world affairs since 1945.

22.960 Problems of World Order I

Emphasizes such topics as appraisal of diverse systems of public order, approaches of international law and international organization to the problem of world order, and the problem of world peace enforcement.

22.961 Problems of World Order II Prep. 22.960, Problems of World Order I
Continuation of 22.960 Problems of World Order I, in which political problems of world order are stressed. Representative topics considered are arms control, disarmament, strengthening the United Nations and evaluation of world government proposals.

22.990 Assigned Reading

Assigned reading under supervision of a faculty member.
Credit to be assigned.

22.991 Thesis

Thesis supervision by individual members of the department.
Credits: 6 quarter hours.

Psychology

Professors

A. Bertrand Warren, B.A., M.A.,
Ph.D., Chairman
John C. Armington, B.S., M.S., Ph.D.
Warren H. Teichner, B.A., M.S., Ph.D.
Harold S. Zamansky, B.S., Ph.D.

Associate Professors

Charles Karis, B.A., M.A., Ph.D.
Helen S. Mahut, B.A., M.A., Ph.D.
Bertram Scharf, B.A., Ph.D.

Assistant Professors

Edward A. Arees, B.A., M.S., Ph.D.
Roger F. Brightbill, B.A., Ph.D.
Richard H. Lent, B.A., M.A., Ph.D.
Ina Samuels, Ph.B., B.A., M.A., Ph.D.
Dale R. Schissler, B.S., Ph.D.

Lecturers

R. Ernest Clark, B.A., Ph.D.
James B. Fraser, B.E.E., Ph.D.

Admission

To be enrolled for graduate work in psychology, applicants must have obtained a bachelor's or master's degree from a recognized institution. Applicants are expected to have had at least 15 semester hours of psychology, including experimental psychology and statistics. This requirement may be waived in some cases. All applicants must take the Graduate Record Examination. The Miller Analogies Test is desirable but not required.

Applicants must submit transcripts of all previous academic work and three letters of recommendation from persons familiar with the student's academic potential. Applications for admission should be completed no later than March 1 of the year in which they expect to enroll.

THE MASTER'S DEGREE

The master's degree is usually taken en route to the Ph.D. Requirements for this degree are 42 quarter hours of academic work including research for six quarter hours of credit, and the passing of a written qualifying examination. The academic work, planned as an integral part of the doctoral program, is outlined on the following pages.

THE DOCTOR OF PHILOSOPHY DEGREE

Residence Requirement

The residence requirement is satisfied by one year of full-time graduate work after admission to doctoral candidacy.

Degree Candidacy

Degree candidacy is established in accordance with the general Graduate Division regulations.

Qualifying Examination

Students must take a qualifying examination no later than two years after admission to the graduate program. This exam is generally given in April and covers major areas of study. The examination in any area may be repeated with the approval of the Departmental Graduate Committee.

Comprehensive Examination

During the period of doctoral degree candidacy, each student must pass a comprehensive examination in the area of his specialty.

Course Requirements

A minimum of 39 quarter hours of academic work beyond those required for the Master's Degree is required. The particular nature and number of courses must be approved by the adviser and the Departmental Graduate Committee. Approved courses may be taken in other departments.

Thesis Requirement

A student may start his thesis work during his first year of doctoral candidacy. A thesis committee will be appointed by the Chairman of the Department upon the recommendation of the Departmental Graduate Committee. The thesis committee will be responsible for initial approval of the thesis in its final form.

Language Requirement

A reading knowledge of one foreign language is required. Normally the language selected will be French, German, or Russian. Other languages may be selected by petition to the Departmental Graduate Committee. Proficiency in a language shall be determined in a manner prescribed by the Departmental Graduate Committee. The student must take the language examination during his first two years of study.

Final Oral Examination

The final oral examination is taken after completion of all other requirements for the degree. This examination will not be held until at least

two weeks after the thesis has been accepted by the Departmental Graduate Committee and must be passed at least two weeks before the commencement at which the degree is to be awarded.

The final oral examination will deal with the subject matter of the doctoral thesis, significant developments in the field of the thesis work, and subject matter as required by the examining committee.

Graduate Program

The graduate program will normally be taken in accordance with the following pattern:

FIRST YEAR					
Fall		Credits	Winter		Credits
19.801	Statistics I*	2	19.802	Statistics II	3
19.817	General Exp.	4	19.818	General Exp.	4
19.980	Research		19.981	Research	
	Methods	2		Methods	2
		8			9
Spring			Credits		
	19.803	Statistics III		3	
	19.819	General Exp.		4	
	19.982	Research			
		Methods		2	
				9	

SECOND YEAR

Six quarter hours of research and 12 quarter hours of electives must be taken during the second year.

All course work beyond the first year is elective and is determined by the student and his adviser with the approval of the Graduate Committee except that before receiving the Ph.D. each student must have completed a two-term sequence in the social-personality area of psychology and a two-term sequence in the neurophysiological area of psychology.

DESCRIPTION OF COURSES

All courses carry three quarter hour credits unless otherwise specified.

19.801 Statistics I

A thorough review of basic descriptive and predictive statistics, emphasizing the choice of appropriate statistical models for various scales of measurement. Students may be exempted from this course by passing an examination which is administered during the first week of classes. No credit toward a graduate degree in psychology.

Credits: 2 quarter hours.

(Offered yearly, Fall Quarter)

*This course gives no credit toward a degree.

19.802 Statistics II

Prep. 19.801 or Equivalent

19.803 Statistics III

Prep. 19.802

The content of the above two courses includes probability, correlation, analysis of variance, co-variance, and non-parametric techniques.

19.806 Psychological Scaling

Measurement theory, psychophysical methods, examples of various scales used in psychology.

19.807 Mathematical Models

Several theories which generate quantitative predictions of behavior are presented.

19.817 General Experimental Psychology I

Credits: 4 quarter hours.

19.818 General Experimental Psychology II

Credits: 4 quarter hours.

19.819 General Experimental Psychology III

The above three courses provide the fundamentals of sensory processes, perception, learning and cognition.

Credits: 4 quarter hours.

19.828 Psychoacoustics I

19.829 Psychoacoustics II

The above two seminars will include such topics as theories of pitch perception, models of loudness, critical bands, interaural integration and detection theory. Physiological and psychological data will be correlated. Opportunities for seminar reports based partly upon experimental work will be available.

19.830 Learning I

Investigation of contemporary issues in classical and instrumental conditioning. Emphasis will be placed upon a critical analysis of specialized research areas such as secondary reinforcement, discrimination, and generalization.

19.831 Learning II

Analysis of current research trends in human learning. Areas of concern and issues include serial learning, paired associate learning, and verbal behavior.

19.833 Perception

A detailed consideration of research in such areas as form, space and pattern perception, recognition, and the effects of set and motivation on perception. Physiological concomitants of perceptual phenomena will be considered.

19.840 Physiological Psychology I

19.841 Physiological Psychology II

The above two courses will provide fundamental concepts and techniques in physiological psychology.

19.844 Physiological and Comparative Psychology I

19.845 Physiological and Comparative Psychology II

19.846 Physiological and Comparative Psychology III

The above three seminars provide a shared background, key concepts and central issues of the field of physiological and comparative psychology.

19.849 Historical and Philosophical Backgrounds of Psychology

The evolution of contemporary theoretical concepts and issues from their historical origins in philosophy and the physical, social, and medical sciences will be considered. Major emphasis will be on the emergence of the scientific method in psychology.

19.850 Historical and Philosophical Backgrounds of Psychology

Advanced seminar in selected topics in the historical and philosophical foundations of psychology.

19.860 Vision I

19.861 Vision II

These two seminars will cover classical and modern problems in vision. Recent journal articles will provide primary source materials for discussion. Consideration will be given to problems of stimulus specification, retinal structure, photochemistry, and psychophysical measures of sensitivity, color vision, and electrophysiology.

19.870 Research in Cognition and Psycholinguistics I

19.871 Research in Cognition and Psycholinguistics II

19.872 Research in Cognition and Psycholinguistics III

The above three seminars are devoted to current research and theory in such areas as concept attainment, problem solving, long and short term memory, language acquisition, perception of language, transformational grammars and linguistic competence.

19.880 Sensory Psychophysiology I

19.881 Sensory Psychophysiology II

Concentration on the anatomy and physiology of the various sensory systems, and correlation of these data with psychophysical and perceptual concepts. Laboratory work will be included.

19.883 Psychophysiology I

19.884 Psychophysiology II

Selected topics on the interdependencies among behavioral and physiological regulatory systems; thermoregulation, respiration, cardiovascular functions, etc., their relations to central and autonomic control and to behavioral mechanisms; reactions to stressors, physiological conditioning, orienting behavior.

19.901 Personality I

Following a survey of the Freudian conceptualization of the normal personality and its development, the course will examine critically the experimental evidence bearing upon a number of concepts (e.g., anxiety, repression, aggression) basic to psychoanalytic theory.

19.902 Personality II

A survey of more recent developments in personality theory, and an examination of the experimental evidence bearing upon the relevant assumptions and concepts (e.g., cognitive styles, need for achievement).

19.905 Personality Theory and Research I

19.906 Personality Theory and Research II

The above two seminars give a critical examination of the fundamental concepts and assumptions of several major personality theories, based on a survey of recent research in personality. Characteristic problems in personality research will also be considered.

19.920 Social Psychology I

19.921 Social Psychology II

The above two courses study group phenomena and the influences of the group upon the thought and behavior of the individual. Such topics as social interaction, perception, opinions, attitudes, leadership, and social conflict will be discussed.

19.980 Research Methods I

19.981 Research Methods II

19.982 Research Methods III

These three courses provide instrumentation and laboratory techniques through instruction and participation in ongoing laboratory projects.

19.990 Special Topics in Psychology

Credits to be arranged.

19.991 Thesis

Experimental work for the master's degree requirement.

Credits: 6 quarter hours.

(Offered yearly)

19.992 Research Problems

Experimental or theoretical work for master's degree candidates.

Credits: 6 quarter hours.

(Offered yearly)

19.995 Thesis

Experimental and theoretical work for Ph.D. candidates.

Credits: 6 quarter hours.

(Offered yearly)

Sociology and Anthropology

Professors

Frank F. Lee, B.A., M.A., Ph.D.,
Chairman

Rose L. Coser, B.A., M.A., Ph.D.

Stephen Schafer, D. Jur., Prof.
Agrégé

Associate Professors

Theodore N. Ferdinand, B.S., M.S.,
Ph.D.

Morris Freilich, B.A., Ph.D.

Leo Miller, B.A., M.S., M.P.H., Ph.D.

Morton Rubin, B.A., M.A., Ph.D.

Assistant Professors

William J. Bowers, B.A., Ph.D.

John D. A. Ferguson, B.A., M.A.,
Ph.D.

Elliott A. Krause, B.A., M.A., Ph.D.

Masri Singarimbun, B.A., Ph.D.

Robert S. Weppner, B.S., M.S., Ph.D.

Admission

To be enrolled for graduate study in the Department of Sociology and Anthropology, applicants must have obtained a bachelor's degree from a recognized college or university. The undergraduate program should have included at least 15 semester hours of sociology or anthropology, but qualified applicants with less than this amount of course work will be considered on an individual basis. In addition, applicants should have taken an undergraduate course in statistics and one in theory. If such courses have not been taken, students must take basic courses in statistics and social theory in addition to the regular requirements. All applicants must have taken all three sections of the Graduate Record Examination: Verbal, Mathematics, and Advanced. Other tests such as the Miller Analogy Test may be submitted in addition.

THE MASTER'S DEGREE

FULL-TIME PROGRAM

Forty-two quarter hour credits of academic work are required. With the approval of the faculty adviser, a maximum of six quarter hours may be elected from graduate courses in other departments, and a maximum of eight quarter hours may be elected from advanced undergraduate courses. Course work must be approved in advance by the Departmental Graduate Committee.

The department offers a graduate program that leads to a Master of Arts degree in Sociology, Social Anthropology, or Sociology with a specialization in Criminology. In addition, a student may pursue the following fields of concentration: theory, research methods, social change, and social structure.

A Master's Paper is required for three quarter hours. This paper must be based on empirical or library research, and must meet criteria for publication in a professional journal, as determined by the Examination Committee.

Students who take a full-time program can generally complete their course requirements in one year and obtain their M.A. as soon as their Master's paper is completed.

The following courses are required for an M.A. in Sociology:

	Credits
20.801 Theories of Social Anthropology	3
20.805 Research Methods in Anthropology*	3
21.805 Foundations of Social Theory*	3
21.806 Contemporary Sociological Theories I	3
21.807 Contemporary Sociological Theories II	3
21.810 Introduction to Research Methodology*	3
21.811 Multivariate Analysis	3
21.814 Advanced Social Statistics†	3
21.991 Master's Paper	3
	<hr/> 27
Electives	15
	<hr/> 42

The following courses are required for an M.A. in Social Anthropology:

	Credits
20.801 Theories of Social Anthropology	3
20.805 Research Methods in Anthropology*	3
20.806 Field Work	3
20.810 Primitive Social Organization	3
20.825 Language and Culture	3
21.806 Contemporary Sociological Theories I	3
21.807 Contemporary Sociological Theories II	3
21.810 Introduction to Research Methodology*	3
21.814 Advanced Social Statistics†	3
21.991 Master's Paper	3
	<hr/> 30
Electives	12
	<hr/> 42

*Upon the recommendation of the Admissions Committee, students who are proficient in these fields may substitute other courses.

†An undergraduate course in statistics or 21.813 is prerequisite.

The following courses are required for an M.A. in Sociology with specialization in Criminology:

	Credits
21.810 Introduction to Research Methodology*	3
21.811 Multivariate Analysis	3
21.814 Advanced Social Statistics†	3
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COOPERATIVE PLAN

Under this plan, the student is employed full-time in work related to his academic program during alternate quarters of his graduate career. In his first year, the student ordinarily will take a full-course load in the Fall and Winter Quarters, and be employed full time in the Spring and Summer. The second-year program of study and work will be adapted to the individual student.

PART-TIME PROGRAM

The admission and course requirements are the same as for the full-time program.

THE DOCTOR OF PHILOSOPHY DEGREE

The Department offers programs leading to the Ph.D. in two areas of specialization, social anthropology and socialization. A limited number of students will be enrolled in these programs so as to provide highly personalized study and research training with individual supervision.

Admission

Applicants to the doctoral program should apply for admission not later than February of the year in which they expect to complete the requirements for the master's degree. They must submit transcripts of their graduate work and three letters of recommendation. Students coming from other schools must, in addition, submit their undergraduate transcripts and their Graduate Record Examination scores.

*Upon the recommendation of the Admissions Committee, students who are proficient in these fields may substitute other courses.

†An undergraduate course in statistics or 21.813 is prerequisite.

Residence Requirement

The University's residence requirement can be satisfied by one year of full-time graduate work or its equivalent beyond the M.A. degree. Most students should expect to spend approximately two years or the equivalent in full-time graduate study beyond the requirements of the master's degree.

Degree Candidacy

Degree candidacy is established in accordance with the general Regulations of the Graduate Division.

Qualifying Examination

Students will be examined on their basic knowledge of Theories and Research Methods and one field of their choice during the first year after fulfillment of course requirements for their M.A. degree.

Course Requirements

Forty-two quarter hours of academic work is required beyond the master's degree. The total graduate program leading to the Ph.D. consists of 84 quarter hours beyond the B.A. degree. Of these, 33 quarter hours must be taken in sociology and 12 quarter hours in social anthropology. In addition, a minimum of 12 quarter hours will be taken as a minor either in social anthropology or in another department of the University.

All courses will be approved by the student's adviser and the Departmental Graduate Committee. Students entering from another university may be required to take certain basic courses before proceeding with the doctoral program.

Language Requirements

A reading knowledge of French and German is required. The Departmental Examination Committee will prescribe the manner in which proficiency in language will be determined. Another language or a three-course sequence in mathematics may be substituted for either French or German if needed for the student's future career. Petition for such substitutions must be submitted for approval to the Departmental Graduate Committee. Language requirements must be satisfied before admission to the comprehensive examination, and at least nine months before the June at which the Ph.D. degree is to be awarded.

Comprehensive Examination

During the period of doctoral degree candidacy, each student must pass a comprehensive examination. This will be given in four parts, and will cover sociological theories, social research methods, social anthropology, and one field to be chosen by the student with the approval of

the Departmental Graduate Committee. Before admission to this examination, students must have fulfilled their language requirements. The Comprehensive Examination must be passed at least nine months before the June at which the Ph.D. degree is to be awarded.

Doctoral Dissertation

The student must submit a Prospectus describing the topic of his doctoral dissertation, his methods of research, and the theoretical relevance of his problem. This Prospectus must be approved by the Departmental Steering Committee. A Dissertation Committee, consisting of the dissertation adviser, two readers within the Department, and one reader from outside the Department, will be appointed by the Departmental Chairman upon recommendation of the Departmental Steering Committee. The Dissertation Committee will be responsible for approval of the dissertation before the final defense. A finished draft of the dissertation must be available to the Department in three copies at least six weeks before the June at which the degree is to be awarded. The adviser will make arrangements for the date of the final oral examination.

Final Oral Examination

The dissertation will be defended after completion of all other requirements for the doctoral degree. This oral defense will be held approximately four weeks after the dissertation has been accepted by the Dissertation Committee, and at least two weeks before the commencement at which the degree is to be awarded.

This examination will deal with the subject matter of the doctoral dissertation and other subject matter deemed appropriate by the examining body.

DESCRIPTION OF COURSES

All courses carry three quarter hour credits unless otherwise specified.

SOCIAL ANTHROPOLOGY

20.801 Theories of Social Anthropology

History of major contemporary orientations in the field. Evolutionary approaches, culture area and historical analysis, functionalism, role structure, comparative methods, social relations approaches, and the theory of cognitive structure.

(Offered Winter Quarter)

20.805 Research Methods in Anthropology

Data collection through participant observation, use of personal documents, and various analytic methods in ethnology.

(Offered Fall Quarter)

20.806 Field Work

Prep. 20.805

Data pertaining to problems developed in 20.805 will be collected from the general Boston area, and attempts will be made to develop these pilot projects into carefully designed projects.

(Offered Winter Quarter)

20.810 Primitive Social Organization

Institutions of primitive societies; comparative and functional analysis of a limited number of societies. The dynamics of continuity and change of culture and social organization. (Offered Fall Quarter)

20.820 Peasant Society and Culture

Institutions of peasant society. The structure of traditional civilizations and the interrelations between urban and local communities; comparative and functional analysis of the peasant community and the dynamics of change from peasant to post-peasant and industrialized societies. (Offered Spring Quarter)

20.825 Language and Culture

Communication in non-human societies. Theories of the evolution of language. Language and thought. Structural linguistics. Recent developments in Linguistic Theory. (Offered Biennially)

20.830 Culture and Personality

Examination of current theory and method in the study of the interplay between personality and culture. Contributions by various disciplines are discussed. (Offered Winter Quarter)

20.840 Comparative Community Studies

Intensive review of community studies in developed and developing areas. Examination of methods for comparative analysis. (Offered Biennially)

20.850 Comparative Religion

Nature and institutionalization of primitive, ancient, and contemporary religions. Exploration of religious concepts and movements in relation to social, religious, and political organization. (Offered Biennially)

20.860 Comparative Economic Systems

Types of economic systems in simple societies: reciprocal, redistributive, market exchange. Economic relations as part of social relations: land tenure systems, credit systems, savings mechanisms. The transition from subsistence to cash economies. (Offered Spring Quarter)

20.870 Anthropology of History

Origins and growth of the institutions of civilization; specialization, social stratification in the dynamics of traditional civilizations. Also, some special topics of contact and change. (Offered Spring Quarter)

20.880 Latin American Cultures

Focus will be on Meso-America. Examination of Aztec and Mayan cultures and their influences. The effects of the Spanish Conquest on the area will be studied. Analysis made of present-day tribal, peasant, and complex cultures. (Offered Spring Quarter)

20.906 Models of Social Structure

Strategy of model building. Models of kinship structure and of more complex systems. Particular attention will be paid to the work of Lévi-Strauss, Leach, and other modern structuralists. (Offered Biennially)

20.930-21.930 Social and Cultural Change

Two-quarter course, in conjunction with Sociology.

Analysis of the changing patterns in social, economic, and political institutions. Modern social trends are discussed.

20.980 Contemporary Issues

Contemporary issues in the field of anthropology. Supervised readings and written reports on special problems.

20.990 Seminar

Discussion of selected topics in the field of anthropology. Consent of Departmental Chairman required.

Credits to be arranged.

20.991 Master's Paper

Empirical or library research meeting the criteria for publication in a professional journal. Supervision by members of the Department.

SOCIOLOGY

21.805 Foundations of Social Theory

The development of European and American sociology from social thought during the past century. Leading representatives and concepts of the evolutionary, organismic, conflict, formal, and social behavioral schools will be discussed and analyzed. (Offered Fall Quarter)

21.806 Contemporary Sociological Theories I Prep. 21.805 or Equivalent
Major concepts of sociological theory: social control and deviance, power and authority, cohesion and conflict, class and bureaucracy, alienation and anomie, status and role, the generalized other and the self. The classic theorists will be read, and student papers will be presented. (Offered Winter Quarter)

21.807 Contemporary Sociological Theories II Prep. 21.806
Emphasis will be on the analysis of social structure and social functions. Development of functionalism as an analytic method in anthropology and sociology. Classic theorists will be read and student papers will be presented. (Offered Spring Quarter)

21.808 Sociological Analysis Prep. 21.807
The bearing of theory on research and the bearing of research on theory. Tabulation and cross-tabulation as a conceptual device for typology and index construction. (Offered Biennially)

21.810 Introduction to Research Methodology 2 Cl.; 2 Lab.
Methodology of empirical social research including survey techniques, interviewing, questionnaire construction, and the logic of research design. Students will take part in a survey. (Offered Fall or Winter Quarter)

21.811 Multivariate Analysis Prep. 21.810 2 Cl.; 2 Lab.
Selection of appropriate research designs, the interpretation of findings, and the relationship of research to theory. Systematic analysis will be made of selected research studies. (Offered Winter or Spring Quarter)

21.812 Controlled Observation Methods Prep. 21.810 2 Cl.; 2 Lab.
Research on the formation and maintenance of small groups. Social interaction will be systematically observed and recorded under laboratory conditions.

21.813 Social Statistics 2 Cl.; 2 Lab.
An introduction to the statistics of measurement, including probability distributions, sampling, parameter estimation, confidence intervals, tests of significance, and chi-square. (Offered Fall Quarter)

21.814 Advanced Social Statistics Prep. 21.813 or Equivalent 2 Cl.; 2 Lab.
The study of linear regression, correlation, analysis of variance, and non-parametric techniques. (Offered Winter Quarter)

21.815 Computer Analysis Prep. 21.814 2 Cl.; 2 Lab.
Practical use of correlation, analysis of variance, and factor analysis demonstrated by computer methods. (Offered Spring Quarter)

21.816 Simulation of Social Behavior Prep. 21.815 2 Cl.; 2 Lab.
Computer simulation will be applied to the study of social behavior with particular attention to voting, decision-making, and social mobility. (Biennially)

21.817 American Society
Study of the development of and the changes in the institutional structure of American society in comparison with certain other social systems.

21.820 Sociology of Deviant Behavior
Applications of sociological concepts and principles to some problems of social disorganization in industrial societies. Analysis of such problems as suicide, prostitution, physical handicaps, unemployment, alcoholism, sexual deviance, and gambling. (Offered Fall Quarter)

21.825 Sociology of Crime
Analysis of the crime factors, criminal typology, occasional and professional criminals, habitual criminality, abnormality and crime, white-collar criminals, the criminal crowd, social implications. (Offered Biennially)

21.827 Sociology of Delinquency
Social and psychological factors of delinquency and their implications for prevention, rehabilitation, and treatment. (Offered Biennially)

21.830 Penology and Corrections Prep. 21.825 or 21.827
Police, court, corrections. The penal system and its treatment methods. Prison. Capital punishment. Probation and conditional sentencing. The inmate society. Parole. After-care. Social consequences of crime. (Offered Fall Quarter)

21.831 Criminal Law
The development and principles of American criminal law. The characteristics of major crimes. The Model Penal Code of the American Law Institute. Administration of criminal justice. The theory and practice of Supreme Court decisions. (Offered Biennially)

21.837 Sociology of Law

Fundamentals of law. The concept of social control. Order and Law. Consensus and conflict. Analysis of the normative-formative influences of law. Mores and morals. The concept of justice. Analysis of some legal institutions.

(Offered Spring Quarter)

21.840 Sociology of Medicine

Social aspects of illness and medicine, historically and cross-culturally. Illness and the medical profession in modern society and their structural settings: the community, the hospital, the medical school. Research studies in the field will be examined critically and problems for future research will be specified.

(Offered Biennially)

21.847 Formal Organizations

Analysis of the goals, functions, and consequences for the individual in modern organizations. Aspects of bureaucratization will be examined within business firms, public institutions, and private associations.

(Offered Biennially)

21.850 Work and Society

The literature of various fields will be reviewed on the subject of work and society. The contributions of economic anthropology, industrial sociology, and the psychology of occupations and careers will be discussed. Current research will be examined intensively.

(Offered Biennially)

21.855 Political Sociology

Sociological analysis of power relations and power systems with special attention to the bases of political power, processes of change in power, and the part played by violence and revolutionary movements.

(Offered Biennially)

21.860 Intergroup Relations

The relations between various racial, nationality, cultural, and religious groups with emphasis on historical development. Particular attention will be paid to American society with its specific problems of adjustment and assimilation.

(Offered Biennially)

21.870 The Family

Social structure and social functions of the family as a social institution. Relations between the family and other institutions in society will be examined comparatively and historically.

(Offered Biennially)

21.880 Community Analysis

Ecological theories of man's relation to his physical environment. Development of the concept, and discussion of methods for community study. Comparison between rural communities and urban neighborhoods. Discussion and evaluation of community action programs.

(Offered Spring Quarter)

21.885 Urban Sociology

Theories of the development of urban life. Comparisons between pre-industrial and industrializing urban areas. Methods for the study of urban social structure and change. Evaluation of contemporary metropolitan action programs.

(Offered Winter Quarter)

21.890 Middle-East Area Study

Socio-cultural analysis of the Middle East. Ecological, structural, institutional, and normative factors in nomadic, rural, and urban life. Comparative regional analysis. (Offered Biennially)

21.895 Latin American Societies

Study and analysis of selected Latin American societies with particular attention to such countries as Cuba, Mexico, Peru, and Brazil. Emphasis on urbanization and industrialization, social and political change. (Offered Biennially)

21.900 Individual and Society

Socialization and adjustment from the standpoint of Horney, Erikson, Sullivan, Cooley, Thomas, Mead, and Riesman. A consideration of some of the principal stress-engendering features of complex societies. (Offered Winter Quarter)

21.910 The Sociology of Science

The functions of science and technology in occupational and structural social change. The works of Price, Sarton, Cohen, Kuhn, Ogburn, and Merton will be consulted. (Offered Biennially)

21.920 Social Stratification

Theories of inequality between groups in historical perspective, from classical to modern industrial times. Discussion and evaluation of sociological research in social stratification in regard to different social and cultural groups. (Offered Fall Quarter)

21.930-20.930 Social and Cultural Change

Two-quarter course, in conjunction with Anthropology. Analysis of the changing patterns in social, economic, and political institutions. Modern social trends are discussed.

21.940-21.941 Social Control

Two-quarter course. A seminar in research, theories, and methods in the sociology of social control.

21.950-21.951 Seminar in Social Structure

Two-quarter course. A seminar relating current theories and research in sociology, social psychology, and social anthropology.

21.980 Contemporary Issues

Contemporary issues in sociology. Supervised readings and written reports on special problems.

21.990 Seminar

Discussion of selected topics in the field of sociology. Consent of Departmental Chairman is required. Credits to be arranged.

21.991 Master's Paper

Supervision by members of the Department. Empirical or library research meeting the criteria for publication in a professional journal.

21.995 Doctoral Dissertation

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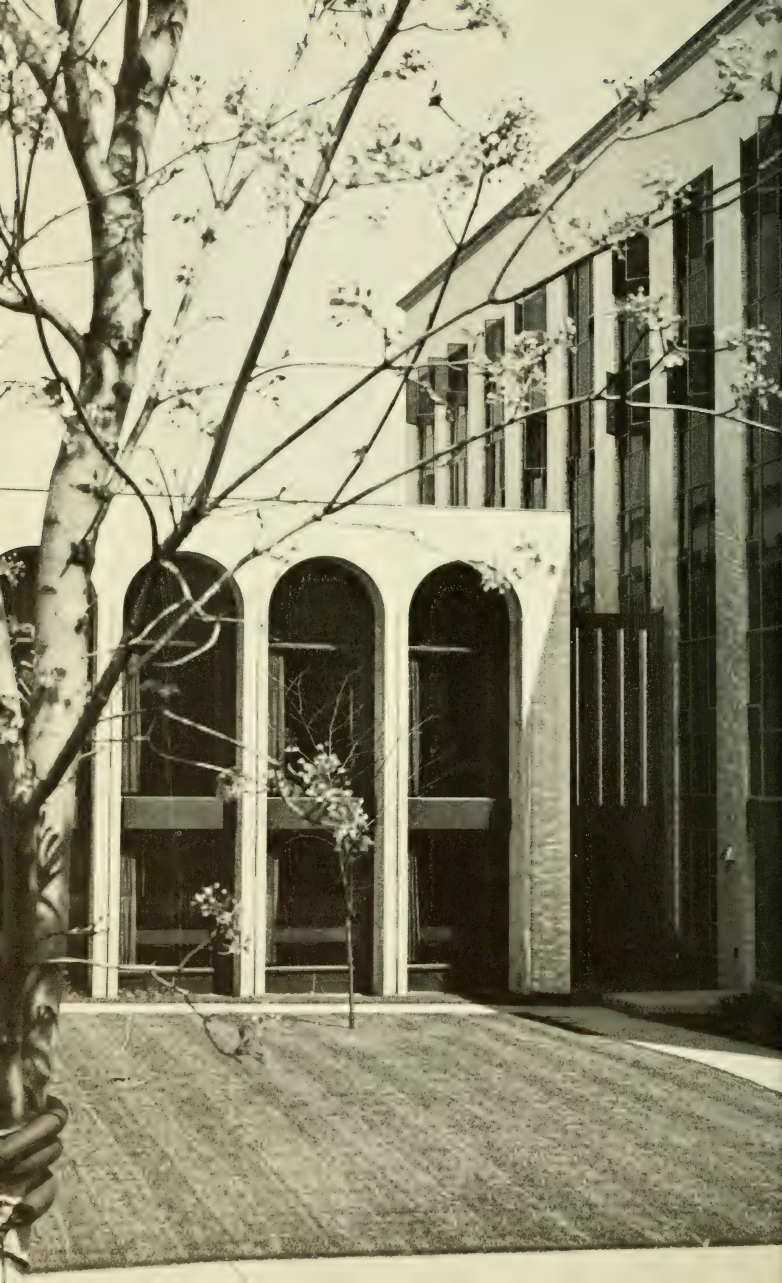
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ACADEMIC CALENDAR 1968-69

Summer Session 1968

Registration Period for Former Students	Monday-Friday	May 27-June 7
Interview and Registration Period for New Students*	Monday-Friday	June 3-June 7
Classes Begin	Monday	June 17
Independence Day, No Classes	Thursday	July 4
Classes End	Tuesday	July 23
Examination Period	Wednesday-Saturday	July 24-July 27

Fall Quarter 1968

Registration Period for Former Students	Monday-Saturday	Aug. 12-Aug. 24
Interview and Registration Period for New Students*	Monday-Saturday	Aug. 19-Sept. 7
Classes Begin	Monday	Sept. 16
Columbus Day, No Classes	Saturday	Oct. 12
Veterans' Day, No Classes	Monday	Nov. 11
Thanksgiving Recess, No Classes	Tuesday-Friday	Nov. 26-29
Examination Period†	Monday-Friday	Dec. 2-6

Winter Quarter 1968-69

Change of Registration for Former Students	Wednesday-Wednesday	Nov. 20-Nov. 27
Interview and Registration Period for New Students*	Wednesday-Wednesday	Nov. 20-Nov. 27
Classes Begin	Monday	Dec. 9
Christmas Vacation, No Classes	Saturday-Wednesday	Dec. 21-Jan. 1
Washington's Birthday, No Classes	Saturday	Feb. 22
Examination Period	Monday-Friday	March 3-March 7

Spring Quarter 1969

Change of Registration for Former Students	Monday-Friday	Feb. 24-Feb. 28
Classes Begin	Monday	March 17
Patriots' Day, No Classes	Saturday	April 19
Final Grades Due in Registrar's Office for June Graduates Taking Third-Quarter Courses	Friday	May 23
Memorial Day, No Classes	Friday	May 30
Examination Period	Monday-Friday	June 2-June 6

*Appointments for interviews with new students must be made at least four days before the date of the interview.

†Examinations for day classes will be held in accordance with the undergraduate examination schedule.

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Edward Dana
William P. Ellison
Ernest Henderson III
Stephen P. Mugar
Joseph G. Riesman
Dwight P. Robinson, Jr.
Alvin C. Zises

Class of 1971

F. Gregg Bemis
Louis W. Cabot
Byron K. Elliott
Chandler Hovey
E. Douglas Kenna
John Lowell
Lawrence H. Martin
Augustin H. Parker, Jr.
William M. Rand
Earl P. Stevenson
Earl H. Thomson

Asa S. Knowles, *ex officio*†

EXECUTIVE COMMITTEE

Harold A. Mock, *Chairman*
Samuel A. Groves, *Vice Chairman*

S. Bruce Black
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Lawrence H. Martin
William M. Rand

Frank L. Richardson
Dwight P. Robinson, Jr.
Robert E. Slater
Farnham W. Smith
Russell B. Stearns
Earl P. Stevenson
Robert G. Stone
Alvin C. Zises

Byron K. Elliott, Asa S. Knowles, *ex officio*

*President Emeritus of the University

†President of the University

ADMINISTRATIVE ORGANIZATION

OFFICERS OF THE UNIVERSITY

Asa S. Knowles, A.B., A.M., LL.D., Litt.D., Sc.D., D.B.A., D.S.Bus.Ed.	President
Carl S. Ell, A.B., M.S., Sc.D., L.H.D., LL.D., D.S.Ed.	President Emeritus
William C. White, B.S., Ed.M., Eng.D.	Executive Vice President
Lincoln C. Bateson, B.B.A., M.B.A.	Vice President — Director of Finance
Jack R. Bohlen, B.B.A.	Vice President for Development
Arthur E. Fitzgerald, E.E., S.M., Sc.D.	Vice President for Academic Affairs and Dean of Faculty
Gilbert G. MacDonald, B.I.E., Ed.M.	Vice President for Student Affairs and Dean of Students
Edward S. Parsons, B.S., Ed.M.	Business Manager
Kenneth G. Ryder, A.B., M.A.	Vice President and Dean of University Administration
Loring M. Thompson, B.S., M.S., M.A., Ph.D.	Vice President and Dean of Planning
Roy L. Wooldridge, B.S., Ed.M.	Vice President and Dean of Cooperative Education

ACADEMIC DEANS AND PRINCIPAL ADMINISTRATIVE OFFICERS

Catherine L. Allen, B.S., M.A., D.Ed.	Dean of Boston-Bouvé College
John S. Bailey, B.S., M.B.A.	Dean of University College
Kenneth W. Ballou, A.B., Ed.M.	Dean of University Relations
Bernard J. Brent, B.S., M.S., Ph.D.	Director of the Graduate School of Pharmaceutical Sciences
Geoffrey Crofts, B.Comm., F.S.A.	Dean and Director of the Graduate School of Actuarial Science
Ray C. Dethy, B.Sc., M.A., Ph.D.	Associate Dean of Education
Martin W. Essigmann, S.B., M.S.	Dean of Research
Gilbert C. Garland, B.S., Ed.M., Ed.D.	Dean of Admissions
James E. Gilbert, B.S., M.A., Sc.D.	Director of the Office of Educational Resources
Joseph M. Golemme, S.B., M.A., C.P.A.	Director of the Graduate School of Professional Accounting

George W. Hankinson, A.B., B.S., M.S.	Assistant Dean of Engineering and Director of the Graduate School of Engineering
Charles W. Havice, A.B., M.A., S.T.B., Ph.D., D.D.	Dean of Chapel
James S. Hekimian, A.B., M.B.A., D.B.A.	Dean of Business Administration
Israel Katz, B.S.M.E., M.M.E.	Dean of Continuing Education
LeRoy C. Keagle, B.S., Ph.D.	Dean of Pharmacy
Wilfred S. Lake, A.B., M.A., Ph.D.	Dean of Liberal Arts
Melvin Mark, B.M.E., M.S., Sc.D.	Dean of Engineering
Frank E. Marsh, Jr., A.B., M.Ed., D.Ed.	Dean of Education
Roland H. Moody, A.B., B.L.S.	Director of the University Library
Rudolph M. Morris, B.S., Ed.M.	University Registrar
Thomas J. O'Toole, A.B., LL.B., M.A.	Dean of Law
Andre P. Priem, B.B.A., M.A.	Director of the Graduate School of Business Administration
Daniel J. Roberts, Jr., B.S., M.B.A., Ed.M.	Comptroller and Assistant Director of Finance
Gustav S. Rook, B.S., Ed.M.	Dean of Lincoln College
Robert Sheehan, A.B., M.A.	Dean of Criminal Justice
Arthur A. Vernon, B.S., M.S., Ph.D.	Dean of Graduate Division
Charlotte E. Voss, B.S., M.S., Ed.D.	Dean of Nursing
Louis Vrettos, B.S., M.A., Ed.D.	Dean of Instruction and Director of the Suburban Campus

GENERAL UNIVERSITY COMMITTEES

THE EXECUTIVE COUNCIL

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William C. White, *Vice Chairman*
Loring M. Thompson, *Secretary*

Lincoln C. Bateson
Arthur E. Fitzgerald

Edward S. Parsons
Kenneth G. Ryder

THE UNIVERSITY COUNCIL

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Kenneth W. Ballou
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James E. Gilbert
Gilbert G. MacDonald

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Rudolph M. Morris
Edward S. Parsons
Daniel J. Roberts, Jr.
Kenneth G. Ryder
Arthur A. Vernon
Roy L. Wooldridge

Asa S. Knowles, *ex officio*

THE ACADEMIC COUNCIL

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Gilbert C. Garland
James E. Gilbert
James S. Hekimian
Israel Katz
LeRoy C. Keagle
William F. King
Wilfred S. Lake
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Robert Sheehan
Arthur A. Vernon
Charlotte E. Voss
Louis Vrettos
Roy L. Wooldridge

Asa S. Knowles, William C. White, *ex officio*

THE FACULTY SENATE

*John S. Bailey
Ralph S. Blanchard, Jr.
Lydia A. Bosanko
Russell E. Brillhart
Marcello J. Carrabes
Robert Cord
Goldie Crocker
James M. Feldman
Robert J. Ferullo
*Arthur E. Fitzgerald
Walter L. Fogg
Norbert L. Fullington
Charles M. Goolsby
Arvin Grabel
E. Vaughn Gulo
Charles F. Haley
*James S. Hekimian
Sidney Herman
Richard Higgins
George Khiralla

*William F. King
*Wilfred S. Lake
Frank F. Lee
Richard Lindhe
*Gilbert G. MacDonald
Wesley Marple
*Thomas E. McMahon
*Rudolph M. Morris
Harold Naidus
Saul Namyet
Paul M. Pratt
Wilfred J. Remillard
Morton Rubin
*Kenneth G. Ryder
Giuliano Sorani
Richard R. Stewart
*Loring M. Thompson
Harold A. Walker
Roy Weinstein
Henry O. Wertz

Presiding Officer

Asa S. Knowles

or

Arthur E. Fitzgerald

*Appointed by the President

GRADUATE DIVISION ORGANIZATION

ADMINISTRATION

William T. Archey, A.B.	Assistant in the Graduate School of Business Administration
Bernard J. Brent, B.S., M.S., Ph.D.	Director of the Graduate School of Pharmaceutical Sciences
Geoffrey Crofts, B.Comm., F.S.A.	Dean and Director of the Graduate School of Actuarial Science
Ray C. Dethy, B.S., M.A., Ph.D.	Associate Dean of Education
Joseph M. Golemme, B.S., M.A., C.P.A.	Director of the Graduate School of Professional Accounting
Charles F. Haley, B.S., M.Ed.	Associate Director of the Graduate School of Education
George W. Hankinson, A.B., S.B., M.S.	Director of the Graduate School of Engineering
John W. Jordan, B.S., M.Ed.	Administrative Assistant in Business Administration
Thomas J. O'Toole, A.B., LL.B., M.A.	Dean of Law
Andre P. Priem, B.B.A., M.A.	Director of the Graduate School of Business Administration
Joseph A. Ross, B.S. Ed.	Administrative Assistant in the Graduate Division
Richard E. Sprague, B.S., B.B.A., M.B.A., Ed.M.	Administrative Assistant in the Graduate Division
Arthur A. Vernon, B.S., M.S., Ph.D.	Dean of the Graduate Division and Director of the Graduate School of Arts and Sciences
Janice Walker, A.B.	Registrar of the Graduate Division
Carol A. Weiss, A.B.	Administrative Assistant in the Graduate School of Education

UNIVERSITY GRADUATE COUNCIL

1967-68

The responsibility of the Council is the determination of broad policies and regulations governing the conduct of graduate work. All new graduate programs must be approved by the Council.

Administrative Members

Arthur A. Vernon, Chairman	Dean of the Graduate Division and Director of the Graduate School of Arts and Sciences
Janice Walker, Secretary	Registrar of the Graduate Division

Bernard J. Brent	Professor of Medicinal Chemistry and Director of the Graduate School of Pharmaceutical Sciences
Geoffrey Crofts	Dean of the Graduate School of Actuarial Science
Ray C. Dethy	Associate Dean of Education
Arthur E. Fitzgerald	Vice President and Dean of the Faculty
Joseph M. Golemme	Director of the Graduate School of Professional Accounting
George W. Hankinson	Assistant Dean of Engineering and Director of the Graduate School of Engineering
James S. Hekimian	Dean of Business Administration
LeRoy C. Keagle	Dean of Pharmacy
Wilfred S. Lake	Dean of Liberal Arts
Melvin Mark	Dean of Engineering
Frank E. Marsh, Jr.	Dean of Education
Andre P. Priem	Director of the Graduate School of Business Administration
Kenneth G. Ryder	Vice President and Dean of Administration
Roy L. Wooldridge	Vice President and Dean of Cooperative Education

**Elected Faculty Members
(Terms Expire September 1968)**

Wendell R. Brown	Associate Professor of Social Science Education
John F. Dunn	Professor of Mechanical Engineering
George M. Krause	Professor of Pharmacy
Robert W. Mullins	Associate Professor of Management
Robert J. Minichiello	Associate Professor of Marketing
Harold R. Raemer	Professor of Electrical Engineering and Chairman of the Department
Raymond H. Robinson	Professor of History and Chairman of the Department
George B. Rochfort, Jr.	Associate Professor of Education
Elliot Spector	Professor of Pharmacology
A. Bertrand Warren	Professor of Psychology and Chairman of the Department

(Terms Expire September 1969)

James T. Barrs	Professor of English
Robert J. Ferullo	Associate Professor of Special Education
Austin W. Fisher	Professor of Engineering Management
Bernard M. Goodwin	Associate Professor of Chemical Engineering
Melvin Howards	Director of the Center for Educational Development
A. Howard Myers	Professor of Industrial Relations
John F. Reinhard	Professor of Pharmacology and Chairman of the Department
John N. Samaras	Associate Professor of Management
Robert A. Shepard	Professor of Chemistry and Chairman of the Department
Albert H. Soloway	Associate Professor of Medicinal Chemistry

**COMMITTEE ON GRADUATE STUDY IN BUSINESS ADMINISTRATION
1967-1968**

Andre P. Priem, Chairman	Director of the Graduate School of Business Administration and Assistant Professor of Management
Roger A. Cossaboom	Associate Professor of Marketing
Joseph M. Golemme	Professor of Accounting, Chairman of the Department, and Director of the Graduate School of Professional Accounting
James S. Hekimian	Dean of Business Administration
Richard Lindhe	Associate Professor of Accounting
Richard J. Morrison	Assistant Professor of Marketing
John N. Samaras	Associate Professor of Management
Arthur A. Vernon	Dean of the Graduate Division

Aims and Scope of the University

Founded in 1898, Northeastern University is incorporated as a privately endowed nonsectarian institution of higher learning under the General Laws of Massachusetts. The State Legislature by special enactment has given the University general degree-granting powers. The University is governed by a Board of Trustees elected by and from the Northeastern University Corporation, which is composed of more than 150 distinguished business and professional men.

From its beginning Northeastern University has had as its dominant purpose the discovery of community educational needs and the meeting of these in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has sought to pioneer new areas of educational service.

A distinctive feature of Northeastern University is its Cooperative Plan, initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922), Liberal Arts (1935), Education (1953), Pharmacy (1962), Nursing (1964), and Boston-Bouv  College (1964). This educational method enables students to gain valuable practical experience as an integral part of their college programs and also provides the means by which they may contribute substantially to the financing of their education. The Plan has been extended to the graduate level in engineering, mathematics, sociology, actuarial science, the pharmaceutical sciences, professional accounting, and business administration.

In the field of adult education, programs of study have been developed to meet a variety of needs. Since 1906 evening curricula have been offered leading to the bachelor's degree. Programs in the arts and sciences, engineering, various fields of business, law enforcement and security, and other areas have been carefully planned to serve mature students who are employed full time during the day and want to broaden their educational background by part-time study. All formal courses of

study leading to degrees through evening programs are approved by the Basic College faculties concerned and are subject to the same quantitative and qualitative standards as the regular day curricula.

The following is a brief outline of the aims and scope of the University's programs.

UNDERGRADUATE COLLEGES

BOSTON-BOUVÉ COLLEGE

Boston-Bouvé College offers three major programs of study: physical education and recreation education, both leading to the degree of Bachelor of Science in Education; and physical therapy, leading to the degree of Bachelor of Science in Physical Therapy.

The combined programs of liberal arts, science, and professional preparation include field experience and student teaching, and leadership training in camping and outdoor education at the Warren Center for Physical Education and Recreation in Ashland. In accordance with Northeastern's Cooperative Plan of Education, students are offered varied opportunities for alternate plans of work-study experience during upper-class years.

THE COLLEGE OF BUSINESS ADMINISTRATION

The College of Business Administration offers programs of study in the principal fields of business leading to the degree of Bachelor of Science in Business Administration. These programs are offered on the five-year Cooperative Plan, under which students gain substantial practical experience in the fields for which they are preparing as an integral part of their undergraduate course of study.

The College also sponsors a Management Institute which offers various special courses for business and industrial executives. One phase of the Institute's work is carried on by the Center for Management Development, which annually conducts an intensive program designed to provide professional growth for middle-management executives who will ultimately be called upon to carry broader executive responsibilities. The plan of instruction, based on a modification of the Northeastern Cooperative Program, permits the participants to maintain their job responsibilities during the six-month period of the course. The Management Development Program is conducted at Andover, Massachusetts, on the campus of Andover Academy.

A Bureau of Business and Economic Research, concerned particularly with problems of the New England region, is an integral part of the College. The Bureau conducts research projects under faculty leadership using undergraduate and graduate cooperative students as research assistants.

COLLEGE OF CRIMINAL JUSTICE

The College of Criminal Justice offers full-time day curricula on the Cooperative Plan leading to the degree of Bachelor of Arts with concentration in the field of law enforcement.

THE COLLEGE OF EDUCATION

The College of Education offers programs leading to the degree of Bachelor of Science in Education. These are designed particularly to meet the needs of high school graduates who desire to prepare themselves for teaching or administrative positions in elementary and secondary schools. Curricula are offered on the five-year Cooperative Plan, which provides for employment in libraries, social service agencies, and school systems.

THE COLLEGE OF ENGINEERING

The College of Engineering offers five-year cooperative curricula in civil, mechanical, electrical, chemical, industrial, and biomedical engineering leading to the degree of Bachelor of Science with specification according to the engineering department in which the student qualifies. A six-year program in power systems engineering in collaboration with public utilities leads to both the bachelor's and master's degree in electrical engineering. The College also offers during evening hours a part-time program leading to the degree of Bachelor of Science in Electrical Engineering. This program extends over eight years, covers the identical courses given in the day cooperative curriculum, and meets the same qualitative and quantitative standards of scholarship.

THE COLLEGE OF LIBERAL ARTS

The College of Liberal Arts offers majors in the usual field of the arts and sciences leading to the degree of Bachelor of Arts. With the exception of preprofessional programs, curricula are normally five years in length and operated on the Cooperative Plan.

LINCOLN COLLEGE

Lincoln College offers technology programs leading to the Associate in Engineering and Bachelor of Engineering Technology degrees. It also offers science technology and paramedical technology programs leading to the Associate in Science degree.

In addition to its traditional curricula, Lincoln College offers interdisciplinary and certificate programs providing technological and professional

development opportunities to meet the special needs of part-time students.

THE COLLEGE OF NURSING

The College of Nursing offers two separate and distinct programs of study, both organized on the Cooperative Plan:

- (a) A three-year curriculum in preparation for the R.N. Examinations and leading to the Associate in Science degree.
- (b) A five-year curriculum also preparing students for the R.N. Examinations, and leading to the degree of Bachelor of Science in Nursing.

Five of Boston's leading hospitals—Beth Israel, Children's Hospital Medical Center, New England Deaconess, Peter Bent Brigham, and Massachusetts General—collaborate with Northeastern by providing suitable cooperative work opportunities during the upper-class years of these programs.

THE COLLEGE OF PHARMACY

The College of Pharmacy offers five-year cooperative curricula leading to the degree of Bachelor of Science in Pharmacy. Cooperative placement begins with the sophomore year and continues for three years, the senior year being devoted to full-time study at the University.

UNIVERSITY COLLEGE

University College, so called because it draws upon the resources of the other colleges of the University, offers courses of study leading to certificates, Associate in Science and Bachelor of Science degrees. University College offers both day and evening programs designed specifically to meet the needs of adult students who wish to undertake part-time curricula during late afternoon or evening hours and on Saturdays. In cooperation with the Forsyth School for Dental Hygienists, University College offers a two-year day curriculum leading to the Associate in Science degree.

Quality standards of instruction and requirements for the degrees offered by University College are wholly consistent with those of the other colleges of the University. University College does not duplicate the offerings of the eight Basic Colleges but provides curricula which cut across traditional subject-matter areas to meet the particular needs of adults desiring formal programs of professional development on a part-time basis, or of young people enrolled in professional schools affiliated with Northeastern University.

GRADUATE AND PROFESSIONAL SCHOOLS

ACTUARIAL SCIENCE

Master of Science in Actuarial Science.

ARTS AND SCIENCES

Master of Arts, Master of Science, Doctor of Philosophy.

BUSINESS ADMINISTRATION

Master of Business Administration.

EDUCATION

Master of Education.

ENGINEERING

Master of Science with course specification, including a special six-year program in power systems engineering leading to both bachelor's and master's degrees in Electrical Engineering; a similar six-year program in mechanical engineering leading to both bachelor's and master's degrees; and Doctor of Philosophy degree in the fields of Electrical, Chemical, and Mechanical Engineering.

LAW

Juris Doctor.

PHARMACEUTICAL SCIENCES

Master of Science with specialization in hospital pharmacy, industrial pharmacy, medicinal chemistry, and pharmacology.

PROFESSIONAL ACCOUNTING

A five-quarter curriculum leading to the degree of Master of Science in Accounting.

Some of these programs are offered on the Cooperative Plan; others provide teaching and research fellowships for able candidates. Administrative headquarters for all graduate programs are located in Churchill Hall.

CENTER FOR CONTINUING EDUCATION

The Center for Continuing Education was established to relate the University to the needs of its community in a period of accelerated change. Its programs are composed of seminars, conferences, institutes, forums, and a wide variety of special courses designed to serve specific needs. The Division of Special Programs, working cooperatively with trade associations and professional societies, offers a wide variety of programs dealing with current needs and problems. Through its Division of Community Services, working with governmental agencies and community organizations, the Center is becoming increasingly involved in social problems on both the local and national level.

Many of these programs are conducted at Henderson House, Northeastern University's conference center in Weston, Massachusetts.

AFFILIATED PROGRAMS

FOR DENTAL HYGIENISTS

The Forsyth School for Dental Hygienists conducts a two-year program of dental hygiene education and general education in cooperation with Northeastern University. Graduates of the program receive the Certificate in Dental Hygiene from Forsyth and the degree of Associate in Science from Northeastern.

FOR MEDICAL TECHNOLOGISTS

In cooperation with the New England Baptist and the New England Deaconess Hospitals, Northeastern University offers a full-time day program on the Cooperative Plan leading to the degree of Bachelor of Arts.

FOR NURSES

Northeastern University offers instruction in the sciences, humanities, and social studies for student nurses from the New England Deaconess and Children's Hospital Medical Center Schools of Nursing.

RESEARCH ACTIVITIES

The faculties of the University are engaged in a wide variety of basic research projects in business, science, social science, pharmacy, and engineering. These are coordinated by the Dean of Research, whose services are University-wide and available to the faculties of all the Colleges.

Although Northeastern is primarily concerned with undergraduate and graduate instruction, the University believes that the most effective teaching and learning takes place in an environment characterized by research activities directed toward extending the frontiers of knowledge.



Buildings and Facilities

LOCATION OF MAIN CAMPUS

The main campus of Northeastern University is located at 360 Huntington Avenue in the Back Bay section of Boston. Many of the city's famous cultural, educational, and philanthropic institutions are situated in the Back Bay, including the Museum of Fine Arts, Symphony Hall, Horticultural Hall, the Isabella Stewart Gardner Museum, the Harvard teaching hospitals, and many schools and colleges. Most are within walking distance of Northeastern University.

Major transportation facilities serving the Boston area are Logan International Airport, two rail terminals, bus terminals serving inter- and intrastate lines, and MBTA subway-bus service within the metropolitan-suburban area. There is a subway stop in front of the campus. For motorists, the best routes to the campus are the Massachusetts Turnpike (Exit 22) and Route 9, of which Huntington Avenue is the intown section.

The campus of 47 acres is divided by Huntington Avenue, with the main educational buildings on one side and dormitories on the other. The principal buildings, all of which have been constructed since 1938, are of glazed brick in contemporary classic style. Most are interconnected by underground passageways.

CARL S. ELL STUDENT CENTER

The Carl S. Ell Student Center provides facilities for student recreation and for extracurricular activities. The Alumni Auditorium, with a seating capacity of 1,300, is part of the Center. Also included are special drama facilities, a ballroom, main lounge, fine arts exhibition area, student offices, conference rooms, and a dining area seating more than 1,000.

THE UNIVERSITY LIBRARY

The Dodge Library is the main library on the Boston campus and maintains an open-stack system. Bound volumes in the library system exceed 190,000, and microfilm titles, 250,000. Collections are located in these areas:

1. The General Collection in the book stacks as indicated by the classification number given in the upper left corner of the catalog card.
2. The Reference Collection in the Cabot Reading Room to the left of the Circulation Desk, which includes bibliographies, government documents, maps, company publications, the information file, association publications, and theses.
3. The Periodical Collection on the basement level occupying the lower Reading Room and the first two back-stack levels.
4. The Reserve Book Collection adjacent to the Periodical Room on the basement level.
5. The Foreign Literature Collections in the Webster Reading Room to the right of the Circulation Desk.
6. The Audio-Facility Division consisting of sound recordings and magnetic tapes for instructional and individual use in the Richardson Room on the second floor. The Fine Arts and Education Collections are also located here.
7. The American and English Literature Collections in the new Literature Reading Room.
8. The Humanities Collection (Philosophy, Psychology, Religion) in Rooms 202 and 203.
9. The Microtext Collection housed on the basement level adjacent to the periodical room. This collection includes 300,000 titles in micro-print, microfilm, and microfiche forms.
10. Directly behind the Circulation Area, the subject areas of Pure and Applied Science and the History Collection are located on the third- and fourth-stack levels.

The Card Catalog is a union list of materials in the University Library and is located in the Webster Reading Room.

The Circulation Department has an IBM card file of all students attending the University. To borrow materials, students should present university identification at the Circulation Desk. For extensive research, where it is not possible for the University Library to acquire materials, the inter-library loan system allows the acquisition of items from other collections throughout the country.

Library Hours (Boston Campus)

Monday — Thursday	7:45 a.m. to 10:00 p.m.*
Friday	7:45 a.m. to 7:30 p.m.*
Saturday	8:30 a.m. to 4:00 p.m.
Sunday	1:00 p.m. to 10:00 p.m.*

The only days in the year that the Library is closed are Thanksgiving and Christmas.

The University Library System includes two libraries in the Division of Research. Physics-Electrical Engineering is housed in 325 Dana Research Center and Chemistry-Mathematics is housed on the fifth floor of the United Realty Building.

SUBURBAN CAMPUS

The Suburban Campus, located near the junction of Routes 128 and 3 in Burlington, Massachusetts, was established to meet the needs of individuals and of industry in the area.

In addition to graduate courses in engineering, physics, mathematics, business administration, science, education, and the arts, portions of undergraduate programs leading to the associate and bachelor's degrees, special programs for adults, and non-credit state-of-the-art programs are offered.

HENDERSON HOUSE

The University's conference center, Henderson House, is located in Weston, Massachusetts. The Center for Continuing Education conducts short-term courses, seminars, and special institutes for business, professional, and research groups. Henderson House is 12 miles from the main campus.

WARREN CENTER

The Warren Center for Physical Education and Recreation in Ashland, Massachusetts, serves as a year-round outdoor laboratory for students in Boston-Bouvé College. There are facilities for conferences, special education in arts and crafts, and sports, including aquatics. Buildings include a lodge, cottages, and an infirmary.

MARINE SCIENCE INSTITUTE

The Marine Science Institute at Nahant, Massachusetts, about 20 miles northeast of Boston, is a research and instructional facility primarily engaged in studies of marine biology and oceanography. The Institute is operated the year around.

*On these days the following reading rooms are open until 1 a.m., and during examination periods they are open 24 hours a day: Reference, Richardson, Literature, and Humanities.

GRADUATE SCHOOL



GRADUATE SCHOOLS AND DEGREE PROGRAMS

Graduate School of Actuarial Science

Master of Science in Actuarial Science

Graduate School of Arts and Sciences

Master of Arts Degrees
in the fields of

Economics, English, History, Political Science,
Psychology, and Sociology-Anthropology

Master of Science Degrees
in the fields of

Biology, Chemistry, Health Sciences,
Mathematics, and Physics

Doctor of Philosophy Degrees
in the fields of

Biology, Chemistry, Mathematics,
Physics, Psychology, and Sociology

Graduate School of Business Administration

Master of Business Administration

Graduate School of Education

Master of Education

Graduate School of Engineering

Master of Science Degrees
in the fields of

Chemical, Civil, Electrical, Industrial,
and Mechanical Engineering, and
Engineering Management

Doctor of Philosophy Degrees
in the fields of

Chemical, Electrical, and Mechanical Engineering

School of Law

Juris Doctor

Graduate School of Pharmaceutical Sciences

Master of Science in Hospital Pharmacy
Master of Science in Industrial Pharmacy
Master of Science in Medicinal Chemistry
Master of Science in Pharmacology

Graduate School of Professional Accounting

Master of Science in Accounting

General Graduate Division Regulations

REGISTRATION

Students must register in the Graduate Division Office at the times specified by the Graduate School calendar.

RESIDENCE

All work for advanced degrees must be completed in residence at the University unless approval has been obtained from the Dean of the Graduate Division for work taken elsewhere. Students who are in residence and are using the facilities of the University must register for such work.

PROGRAMS OF STUDY

At the time of his first registration, each full-time student must develop, with the assistance of his faculty adviser, a complete program of study for the degree for which he is registered. All subsequent changes must be approved by his faculty adviser.

Evening part-time students will be expected to complete the required courses outlined by each department, after which the elective courses may be undertaken. The study load for such students is limited to a program of two courses per quarter unless special permission to carry a heavier load is given by the director of the graduate school concerned.

GRADING SYSTEM

The performance of students in graduate courses will be recorded by the instructor by use of the following grades:

A. Excellent

This grade is given to those students whose performance in the course has been of very high graduate caliber.

B. Satisfactory

This grade is given to those students whose performance in the course has been at the level necessary for graduate credit.

C. Fair

This grade is used to indicate that the student's performance in the course may be acceptable but is not consistently at the level expected in graduate work.

F. Failure

This grade is used to indicate unsatisfactory work.

In addition, the following letter designations are used:

- I. Incomplete, without quality designation. This is used when a student does not take the final examination or otherwise fails to complete the work of the course.
- S. Satisfactory, without quality designation. This designation may be used for thesis and seminar work.
- W. Withdrawn without prejudice.

The designation "I" will be changed to a grade upon removal of the deficiencies which caused the grade of "I" to be reported. Such deficiencies must be removed within four weeks after the quarter ends, or the grade of "I" will be changed to a grade of "F." If the deficiencies are due to a missed final examination, permission to take a make-up must be obtained from the director of the respective graduate school within one week following the date of the missed examination, and the examination must be made up at the time specified by the Graduate Division.

WITHDRAWALS

In order to withdraw from a course, a student must fill out an official withdrawal form obtained at the Graduate Division Office or at the Burlington Campus Office. Withdrawals may be made through the ninth week of the quarter. Students will be withdrawn as of the date on which they fill out the form. Ceasing to attend a class or notifying the instructor does not constitute an official withdrawal.

Students who do not attend the first two class sessions and who do not notify the Graduate Division of their intention to withdraw will be dropped from the class for nonattendance.

Requests for withdrawal from a course after the ninth week of the quarter may be submitted to the Director of the appropriate Graduate School, and may be approved to avert unusual hardships on a student.

CLASS HOURS AND CREDITS

All credits are entered as quarter hours. A quarter hour of credit is equivalent to three fourths of a semester hour credit. All classes meet on a quarter basis. In the summer session, classes meet for six-week periods. The academic calendar for each graduate school should be consulted in order to determine the opening and closing dates of the sessions.

THE MASTER'S DEGREE

Admission

Specific requirements for each degree program will be found in the appropriate paragraphs for each graduate school or department.

Academic Classifications

Those students who have a bachelor's degree from an accredited program with acceptable quality of undergraduate work are classified as regular students.

Students whose records do not qualify them for enrollment as regular students may be accepted as provisional students. Provisional students must obtain a B average in the first 12 quarter hours of credit work in order to continue in the graduate program; at that time, they may be reclassified as regular students.

Those students who are not pursuing a specific degree program are classified as special students. Special students must satisfy the requirements for admission and perform work of satisfactory level in order to continue as special students.

Any student whose record is not satisfactory may be dropped by action of the graduate school committee for his program.

Academic Requirements

A candidate for the master's degree must satisfactorily complete an approved program conforming to the requirements of the department or graduate school in which he is registered.

The requirements for the master's degree are a minimum of 40 quarter hours of correlated work of graduate caliber, together with such other study as may be required by the department or graduate school concerned.

In order to qualify for any master's degree except that of Master of Science in Professional Accounting, an average grade of B must be obtained in the necessary quarter hour credits required for the degree, excluding any transfer credits. For the degree of Master of Science in Professional Accounting, an average grade of B must be obtained in 60 quarter hour credits and no less than a C for the remainder of the work. At the discretion of the graduate school committee for each of the various degrees, not more than 9 quarter hours of extra courses or repeated courses may be allowed in order to satisfy the grade requirements for a degree. At the discretion of the graduate school committee for each of the various degrees, the committee may limit the number of C grades allowable to satisfy the grade requirements for a degree.

Within the above limitations for extra or repeated courses, a required course for which a grade of F is received must be repeated with a grade of C or better, and may be repeated once. If a grade of F is received

in an elective course, that course may be repeated once to obtain a grade of C or better, or another elective course may be substituted for it. If a grade of C is received in a required course, that course may be repeated once to obtain a grade of B or better.

Comprehensive Examination

At the discretion of the department, a final written or oral comprehensive examination may be required. Such examinations will be given at least two weeks before the commencement at which the degree is expected.

Thesis

If a thesis is required in partial fulfillment of degree requirements, it must show independent work based in part upon original material, and must meet the approval of the respective graduate school committee.

Instructions concerning preparation of the thesis may be obtained from the respective graduate school committee.

Foreign Language Requirement

An examination to show evidence of ability in one or more foreign languages may be required in some graduate programs. This knowledge is established by an examination arranged by the respective graduate school committee.

Transfer Credits

A maximum of 12 quarter hours of graduate credit obtained at another institution may be accepted toward the master's degree provided the grades are A or B. Grades on transfer credits may not be used for the purpose of obtaining the academic average necessary for completion of the degree requirements.

Time Limitations

Course credits earned in the program of graduate study, or accepted by transfer, are valid for a maximum of seven years unless an extension is granted by the respective graduate school committee.

THE DOCTOR OF PHILOSOPHY DEGREE

The Doctor of Philosophy Degree is awarded to candidates who give evidence of high attainment and research ability in their major field. The degree requirements are administered by committees in charge of each degree program. These committees may be departmental graduate committees or committees of the respective graduate schools depending upon the nature of the program. It is the responsibility of the chairman of the committee to certify to the Graduate Division Office the completion of each requirement for each candidate.

Admission

Each degree program has an established admission procedure for students starting their doctoral work at Northeastern University.

Classification and Degree Candidacy

Students taking advanced graduate work are classified as follows:

1. Doctoral Student

Students in this classification have been admitted to a doctoral program.

2. Doctoral Degree Candidate

Students in this classification are doctoral students who have completed 40 quarter hours of acceptable graduate work beyond the bachelor's degree and have passed the qualifying examination.

3. Special Students

This classification is given to students taking advanced graduate work who are not enrolled for a master's degree, and who have not been admitted to a doctoral program.

Residence Requirement

Candidates for the Doctor of Philosophy Degree must spend the equivalent of at least one academic year in residence at the University taking graduate work. The committee of each degree program specifies the method by which the residence requirement is satisfied.

Qualifying Examination

Students must pass a qualifying examination within time limits set by the committee of the degree program. The material covered in the qualifying examination and the level of course work necessary to prepare for the examination are established by the committee for each program.

Comprehensive Examination

Degree programs may require a comprehensive examination during the time in which a student is a degree candidate. The purpose of this examination is to test the knowledge and skills of the student in a particular area and his knowledge of recent research developments in his field.

Course Requirements

The minimum course requirements of 40 quarter hours constitutes the work normally required for a master's degree. The course requirements beyond this are the doctoral course requirements and the amount of such work necessary in each doctoral program is specified by the committee in charge of the doctoral program.

Dissertation

Each doctoral student must complete a dissertation which embodies the results of extended research and makes an original contribution to the field. This work should give evidence of the candidate's ability to carry out independent investigation and interpret in a logical manner the results of the research. The method of approval of the dissertation is established by the committee in charge of the degree program. The original bound copy of the dissertation must be deposited in the library.

Foreign Language

The nature of the foreign language requirement and how this requirement is satisfied is established by the committee in charge of each degree program.

Final Oral Examination

The final oral examination will be taken after completion of all other requirements for the degree. This examination must be held at least two weeks before the commencement at which the degree is to be awarded.

The committee for the final oral examination for the doctoral degree is appointed by the committee in charge of the degree program, and the Dean of the Graduate Division is notified of the time of the examination.

The final oral examination will be on the subject matter of the doctoral dissertation and significant developments in the field of the dissertation. Other fields may be included if recommended by the examining committee.

Transfer Credit

If transfer credit for doctoral course work is desired, approval for such transfer credit must be given by the committee in charge of the degree program.

Time Limitation

After the establishment of degree candidacy, a maximum of five years will be allowed for the completion of the degree requirements. If a student wishes to obtain a time extension, he may, with the approval of the committee of his degree program, petition the Committee on Doctoral Degree Programs of the University Graduate Council for such extension.

Registration

All students must register in the Graduate Division Office for course work or dissertation as approved by their advisers or the departmental registration officer. After the first registration for doctoral work, registration must be continuous unless withdrawal is allowed by the committee in charge of the degree program. Students must be registered

for dissertation during the quarter in which they take the final oral examination.

INTERDISCIPLINARY PROGRAMS

Some graduate students may wish to pursue doctoral programs whose boundaries overlap substantially into two or more departments. In such cases, an interdisciplinary program may be established which corresponds in scope and depth to doctoral standards, but does not agree exactly with the individual departmental regulations. For such possibilities, the following plan is in operation:

Admission

Application for admission to interdisciplinary doctoral study consists of the submission of a carefully thought-out written proposal describing the areas of proposed study and research. The proposal may be a part of the initial application for admission to graduate study at Northeastern University, or it may be submitted by a student already enrolled. It may be directed to a doctoral degree-granting department or to the Dean of the Graduate Division, who directs it to the appropriate department. In either case, admission to interdisciplinary doctoral study requires favorable recommendation by the sponsoring doctoral degree-granting department and approval by authorized representatives of the graduate study committees of the departments appropriate to the disciplines covered by the applicant's proposal. The sponsoring department becomes the registration base of the student.

Formation of Interdisciplinary Committee

A student who has been accepted for interdisciplinary study must obtain the consent of an adviser who will direct his doctoral thesis. This adviser, who may or may not be a member of the registration department, will be chairman of the interdisciplinary committee for this student. A second member will be appointed from the registration department by its chairman. These two members will obtain one or more additional members or request the Dean of the Graduate Division to do so. At least two departments must be represented on the committee and a majority of the committee must come from doctoral degree-granting departments. The chairman of the registration department will notify the Dean of the Graduate Division of the membership of the committee as soon as arrangements are complete.

Duties of Interdisciplinary Committee

A member of the interdisciplinary committee who is also a member of the registration department will serve as the registration officer to approve the course registration for the student. A copy of the approved course registration must also be filed with the other committee members and with the graduate study committee of the registration department.

The interdisciplinary committee will be responsible for the administration of the qualifying examination, language examination, approval of the thesis, and comprehensive examination. This committee must also certify to the registration department the completion of the requirements for the award of the doctoral degree.

The interdisciplinary committee must assure that the program of the student represents standards comparable to those of the registration department and that the program is not so broad that it has inadequate depth in any area.

The program of the student may be reviewed at any time by the Dean of the Graduate Division to determine whether objectives of the program are being met.

Faculty

- Robert F. Abbanat** Visiting Associate Professor of Management
B.S., M.S., Massachusetts Institute of Technology; M.B.A., D.B.A.,
Harvard University
- Dean S. Ammer** Professor of Management and Director
of the Bureau of Business and Economic Research
B.S., Massachusetts Institute of Technology; M.B.A., Ph.D., New York
University
- Anker V. Andersen** Associate Professor of Accounting
B.B.A., M.B.A., Ph.D., University of Minnesota
- Joseph C. Bailey** Professor of Human Relations
A.B., University of Illinois; A.M., Ph.D., Columbia University
- Stephen N. Brenner** Instructor of Management Science
B.A., B.E., Dartmouth College; M.B.A., Harvard University; D.B.A. Candidate,
Harvard University
- Milton Budoff** Lecturer in Business Administration
M.A., Ph.D., University of Chicago
- Charles W. Collazzo, Jr.** Associate Professor of Marketing
B.A., Northeastern University; M.C.S., M.A., Boston University;
Ph.D., Columbia University
- Roger A. Cossaboom** Associate Professor of Finance
B.S.I.E., Northeastern University; M.B.A., Michigan State University;
D.B.A., Harvard University
- Joseph R. Curran** Assistant Professor of Accounting
B.S., M.B.A., Northeastern University; Ph.D. Candidate, Columbia University
- Leslie M. Dawson** Assistant Professor of Marketing
B.B.A., Iona College; M.A., University of Toledo; Ph.D. Candidate, Michigan
State University
- Ernest M. DeCicco** Associate Professor of Economics
B.S., A.M., University of New Hampshire; Ph.D., Boston University
- James W. Earley** Lecturer in Business Administration
A.B., Holy Cross; B.S., State Teachers College; M.B.A., Northeastern University
- Ralph W. Fingar** Lecturer in Business Administration
B.S., Union College; Ph.D., University of Texas
- Bernard L. Friedman** Lecturer in Business Administration
B.S., M.B.A., Northeastern University
- Edward Y. George** Lecturer in Business Administration
B.Sc., M.A., Cairo University; B.A., American University; Ph.D., New School
for Social Research
- Vincent J. Giovinazzo** Assistant Professor of Accounting
B.S., Rutgers University; M.B.A., Ph.D., New York University

- Paul W. Glennon** **Lecturer in Business Administration**
B.B.A., LL.B., Northeastern University; M.B.A., Boston University;
LL.M., J.S.D., New York University
- Harold M. Goldstein** **Associate Professor of Economics**
B.A., Northeastern University; M.A., Boston College; Ph.D., Clark University
- William H. Gruber** **Associate Professor of Accounting**
B.S., University of Pennsylvania; Ph.D., Massachusetts Institute of Technology
- Robert J. Hehre** **Associate Professor of Finance**
B.S., M.S., Columbia University; M.B.A., Indiana University; D.B.A. Candidate,
Indiana University
- James S. Hekimian** **Dean of Business Administration**
A.B., M.B.A., D.B.A., Harvard University
- Richard B. Higgins** **Assistant Professor of Management**
A.B., Tufts University; Ph.D., Columbia University
- Charles W. Hofer** **Assistant Professor of Management**
B.S., Lehigh University; M.S., Ph.D., New York University
- John R. G. Jenkins** **Associate Professor of Marketing**
B.A., M.A., Cambridge University (England); M.B.A., University of Toronto;
D.B.A., Harvard University
- Ralph C. Jones** **Professor of Accounting**
B.S., M.S., University of Illinois; Ph.D., Yale University
- Edward M. Kaitz** **Lecturer in Business Administration**
M.B.A., Boston College; D.B.A., Harvard University
- Richard Lindhe** **Associate Professor of Accounting**
B.S., M.Ed., Kent State University; Ph.D., University of Chicago
- Ward C. Low** **Lecturer in Business Administration**
B.S., University of Wyoming; Ph.D., Boston University
- Ivory L. Lyons** **Associate Professor of Economics**
A.B., Morehouse College; A.M., Ph.D., Harvard University
- Wesley W. Marple, Jr.** **Associate Professor of Finance**
A.B., Princeton University; M.B.A., D.B.A., Harvard University
- Frank M. Mastrapasqua** **Assistant Professor of Finance and Management**
B.S., Fairfield University; M.B.A., Ph.D., New York University
- Daniel J. McCarthy (L.O.A.)** **Professor of Management**
A.B., M.B.A., Dartmouth College; D.B.A., Harvard University
- Philip R. McDonald** **Associate Professor of Marketing and Management**
B.A., University of British Columbia; M.B.A., D.B.A., Harvard University
- Robert J. Minichiello** **Professor of Marketing**
A.B., Harvard University; M.B.A., Boston University; D.B.A., Harvard University
- Lee R. Morris** **Lecturer in Business Administration**
B.S., Northeastern University; M.S., Massachusetts Institute of Technology;
D.B.A., Harvard University
- Richard J. Morrison** **Assistant Professor of Marketing**
B.A., M.B.A., Harvard University; D.B.A. Candidate, Harvard University

- Robert W. Mullins (L.O.A.)** **Associate Professor of Management**
M.B.A., D.B.A., Harvard University
- Gordon Nielsen** **Professor of Accounting**
B.S., B.A., University of Tulsa; M.B.A., University of Arizona; Ph.D. University of Texas
- Robert E. Otlewski** **Assistant Professor of Management**
B.A., Boston College; M.A., Indiana University; Ph.D. Candidate, Indiana University
- Robert A. Parsons** **Assistant Professor of Management**
B.S., B.A., M.B.A., Northeastern University; M.A. Econ., Boston College; Ph.D. Candidate, Boston College
- Sidney H. Phillips** **Associate Professor of Management**
A.B., Dartmouth College; M.S.C., Stevens Institute of Technology; Ph.D., New York University
- Andre P. Priem** **Assistant Professor of Management and Director of the Graduate School of Business Administration**
B.B.A., M.A., University of Cincinnati; D.B.A. Candidate, Harvard University
- Herman Rochwarg** **Associate Professor of Management**
B.A., Ph.D., Michigan State University
- Anghel N. Rugina** **Professor of Economics and Finance**
B.S., College of Business, Galatz, Rumania; M.A., Ph.D., Academy of High Studies in Economics, Bucharest, Rumania; Ph.D., University of Freiburg, Germany
- Richard W. Safford** **Lecturer in Business Administration**
B.S., Union College; M.S., University of Michigan; Ph.D., Massachusetts Institute of Technology
- Fawzi A. Salem** **Assistant Professor of Accounting**
B.Com., University of Cairo; M.B.A., University of Wisconsin; Ph.D. Candidate, University of Wisconsin
- John N. Samaras** **Associate Professor of Management**
A.B., Boston University; M.B.A., Dartmouth; D.B.A., Harvard University
- Donald Shelby** **Professor of Economics**
B.A., University of Cincinnati; Ph.D., University of California at Berkeley
- Barry Shore** **Assistant Professor of Management**
B.S., Tufts University; M.B.A., University of Massachusetts; Ph.D. Candidate, University of Wisconsin
- Albert Slavin** **Professor of Accounting**
Ed.B., Ed.M., Boston University
- Frank L. Turgeon** **Lecturer in Business Administration**
B.S., Georgetown University; M.B.A., Ph.D., New York University
- Dharmendra T. Verma** **Assistant Professor of Marketing**
B.S., University of Bombay; M.B.A., University of Utah; Ph.D. Candidate, University of Utah
- Arthur H. Walker** **Associate Professor of Management**
A.B., Bowdoin; M.B.A., D.B.A., Harvard University
- Jehiel Zif** **Assistant Professor of Management Science**
B.S., Technion-Israel; M.B.A., Ph.D., New York University

TYPES OF PROGRAMS

The Master of Business Administration Program at Northeastern University is broad in concept. It is aimed at preparing the student for a career in business administration rather than for an immediate or particular position. The curriculum and teaching methods center around the development of basic skills and knowledge appropriate to business administration, rather than upon specialized functional techniques. Although the case method of study is used liberally, a wide variety of teaching methods is employed consonant with particular course objectives. The basic objectives are to confront the student with meaningful learning experiences, to increase skills and knowledge in the basic disciplines underlying business practice, and to develop the judgment and the skills of analysis and decision-making which are so essential to the business manager.

The Graduate School of Business Administration offers two types of programs: a full-time internship program and a part-time program.

The full-time internship program blends one full calendar year of academic study with nine months of coordinated work as an intern in a business or non-profit organization. The internship periods are coordinated into the academic program by means of a continuing research and analysis seminar. A research report covering some phase of the internship situation will be developed during the seminar. This combination of theory and practice gives the student-intern excellent preparation for a career in management.

The part-time program has inherently much of the advantage of the internship-type program. Students are employed men and women who attend classes in the late afternoon and early evening to learn the theory which will complement the practice of their employment. Students attending on a part-time basis may take only two courses per term, unless granted permission for extra courses by the Director of the Graduate School of Business Administration. The part-time student will usually complete the degree program in three to four years, depending upon whether summers are utilized. Courses in this program are offered at both the Huntington Avenue and Burlington campuses by the faculty of the College of Business Administration.

ADMISSION

BASIC REQUIREMENTS

To be enrolled for graduate work in business administration, applicants must have done undergraduate work of high quality, and must have obtained a bachelor's degree from a recognized university or institute of technology. The quality of undergraduate work is considered to be of more importance than the particular field of undergraduate specialization.

Official transcripts of all previous undergraduate work must be made available to the Graduate School of Business Administration. Candidates for the full-time internship program must see to it that transcripts are forwarded in time to allow a thorough review along with the rest of the applicant's admissions documents. Candidates applying to the part-time program must insure that transcripts are available to the Graduate School no later than the time of their personal interview.

Applications for admission may be obtained from the Graduate School Office. In order to be considered for the full-time internship program, applications must be received by March 15. Applications received after that date will be considered if vacancies still exist. Applications for the part-time program will be considered through the regularly scheduled interview period, but earlier decision will be made on applications received before that time.

ADMISSIONS TEST FOR GRADUATE STUDY IN BUSINESS

All applicants for admission must take this examination administered by the Educational Testing Service of Princeton, New Jersey. The test is offered at universities throughout the country several times during the year, usually in July, November, February, and April.

It is recommended that applicants take this test well in advance of the time they intend to apply for admission. Those applying for the full-time program should take the February test, or perhaps even the November test. Those applying for the part-time program should take the April or July test.

PREREQUISITE COURSES

In the past, it was necessary to have completed work in several prerequisite areas of mathematics, accounting, statistics, and economics. At the present time, the program presumes no particular level of competence in these areas, but applicants are advised to gain some background in these areas, as well as in psychology and sociology, if they have opportunity to do so in their curricula.

THE INTERVIEW

A personal interview is not required for applicants to the full-time Internship program, but will be scheduled if the applicant so desires.

Interviews will be scheduled for applicants to the part-time program. The schedule is noted in the academic calendar.

NON-CONTINUOUS STUDY

In some cases, students withdraw from the program for a quarter or a longer period of time. Any student who was not registered for courses during the previous quarter may not subsequently register for courses without first discussing his situation with the Director of the Graduate School of Business Administration.

FINANCIAL INFORMATION

Tuition for master's degree candidates and special students is \$40 per quarter hour of credit.

Tuition Payments

Tuition statements are mailed to students by the Bursar's Office and are payable on or before the date specified. Checks should be drawn payable to "Northeastern University."

Registration Fee

All students new to Northeastern University are charged a registration fee of \$10 at the time of their first billing. There is no application fee at the present time.

Late Payment Fee

A late payment fee of \$5 is charged all students for failure to pay tuition on the due date, unless special arrangements have been approved by the Student Accounts Office.

Make-up Examination Fee

All students given permission to take a make-up of a final examination are charged a fee of \$5.

Student Center Fee

All students on the Huntington Avenue Campus are charged a fee for the services available in the Student Center as follows:

Part-Time Students	\$.75 each quarter
Full-Time Students (including cooperative students)	\$12.50 each quarter
Teaching Assistants and Research Fellows	\$ 6.25 each quarter

Commencement Fee

A fee of \$25 for commencement is required by the University of all degree candidates. This fee is payable on or before May 1 of the year in which the student expects to graduate.

Health Services Fee

All full-time students, including those on the Cooperative Plan and teaching and tuition assistants, will pay a nonrefundable University Health Services fee of \$25 per year. This fee will cover the group Blue Cross-Blue Shield program and the medical services provided by the University Health Service.

Refunds

Tuition refunds will be granted only on the basis of the date appearing on the official withdrawal form filed by the student. Nonattendance does not constitute official withdrawal. Questions regarding refunds should be discussed with the Bursar's Office.

Refunds will be granted as follows:

Official Withdrawal Filed Within:	Percentage of Tuition
First week of quarter	100%
Second week of quarter	75%
Third week of quarter	50%
Fourth week of quarter	25%

FINANCIAL AID

Northeastern University has available fellowships and assistantships for students who are engaged in graduate work. The Graduate Division will send candidates the proper application blanks upon request.

Teaching Assistantships

Teaching assistantships are available in most of the departments offering graduate study. Holders of such assistantships carry a half-time academic load and devote half time to academic assistance in the departments. The assistantship grant includes a stipend and remission of tuition.

Tuition Fellowships

Some departments have available tuition fellowships which remit tuition up to 12 quarter hours of graduate work per quarter. In return, students will be required to assist in the academic work of the department. These fellowships are normally given to students who are in the first year of graduate work.

Research Fellowships

Research fellowships are available in some departments giving graduate work. Holders of such fellowships carry a half-time academic load and devote half time to research in the departments. The research fellowship grant includes a stipend and remission of tuition.

Appointments

Appointments to fellowships and assistantships are ordinarily announced no later than April 15 for the following academic year or summer. Appointments are for one year and may be renewed for a second year; but renewal is not automatic.

Full-Time Duties

Graduate students who hold teaching assistantships, research fellowships, graduate cooperative teaching assistantships, or graduate cooperative research fellowships are expected to devote full time to their studies and the duties of the grant. They may not accept outside employment without the consent of their faculty advisor and the Dean of the Graduate Division.

National Defense Student Loan Program

Under the National Defense Education Act of 1958, a long-term loan program was established to provide financial assistance to students in need of such aid to continue their education. In 1964, this act was amended to permit participation by students carrying at least one half the normal full-time academic workload as determined by the University.

The maximum amount which may be borrowed in one academic year is \$2,500. The total of loans made to a student for all years, including any loans made to him as an undergraduate, may not exceed \$10,000. The actual amount of any award will be determined by the financial position of the student and his family (if applicable) and the availability of funds. Preference is given to outstanding students.

Repayment of these loans begins nine months after the date the borrower ceases to carry, at an institution of higher education, at least one half of the normal full-time academic workload as determined by that institution. The repayment period extends ten years from that point and may be further extended by periods for which he is legally entitled to deferment.

Up to 50 per cent of any such loans (plus interest) shall be canceled for services as a full-time teacher in a public or private nonprofit elementary or secondary school and in institutions of higher education at a rate of 10 per cent (plus interest) for each complete academic year of service, or its equivalent. For services in a school district determined to have a high concentration of students from low-income families, or for teaching services to the physically or mentally handicapped, the cancellation rate is 15 per cent for each complete year of service, and up to 100 percent of any loan (plus interest) may be canceled.

Additional information and appropriate application forms are available through the Graduate Division Office or from the Office of Financial Aid. The application deadline is September 1 for full-time students, or one month prior to the start of the quarter for which aid is requested in the case of half-time students.

Income from Internship

For students in the internship program, a major source of funds will be earnings from the management-internship. During the nine-month period of internship, earnings will average \$6,000.



MASTER OF BUSINESS ADMINISTRATION CURRICULUM

Effective 1968

Students entering the program after May 1968 must complete 64 quarter hours of credit to complete the Master of Business Administration Program. This requirement applies to both full-time and part-time students. The course content for the part-time and full-time programs is essentially the same, but in the full-time internship program, some individual courses are combined into longer courses. In both programs, 56 quarter hours of credit are in the area of required courses.

Part-Time Program

Number	Course	Credit Hours
41.811	Basics of Financial and Managerial Analysis	2
41.812	Profit Planning and Budgeted Systems Analysis	3
41.813	Planning, Decisions and Control Systems	3
49.919	The Economic, Behavioral and Environmental Determinants of Demand	2
43.811	Marketing Management I	3
43.812	Marketing Management II	3
44.811	Financial Management I	3
44.812	Financial Management II	3
45.805	Operations Management I	3
45.806	Operations Management II	3
45.815	Behavioral Concepts	2
45.816	Organizational Behavior I	3
45.817	Organizational Behavior II	3
45.825	Business Policy I	3
45.826	Business Policy II	3
45.987	Strategic Planning-Business Game	2
49.901	Quantitative Economic Decision-Making I	3
49.902	Quantitative Economic Decision-Making II	3
49.903	Quantitative Economic Decision-Making III	3
49.918	Information Theory and Systems	3
Total Credit Hours		56

Full-Time Program

Number	Course	Credit Hours
41.814	Analysis, Planning and Control Systems	5
41.813	Planning, Decision and Control Systems	3
49.919	The Economics, Behavioral & Environmental Determinants of Demand	2
43.813	Marketing Management	6
44.813	Financial Management	6
45.807	Operations Management	6
45.818	Organizational Behavior	5
45.817	Organizational Behavior II	3
45.827	Business Policy	6
45.987	Strategic Planning — Business Game	2
49.901	Quantitative Economic Decision-Making I	3
49.902	Quantitative Economic Decision-Making II	3
49.903	Quantitative Economic Decision-Making III	3
49.918	Information Theory and Systems	3
Total Credit Hours		56

Note: In addition to above-listed courses, successful completion of a continuing seminar course in analysis and written reports is required for graduation.

Elective Courses and Fields of Concentration

In addition to the required courses, the student must complete course work in the elective area to bring his total program to the 64 quarter hours of credit required for the Master of Business Administration degree. In most cases, this will be eight quarter hours.

In selecting elective courses the student is encouraged to take several courses in one area of concentration in order to develop a higher degree of competence in that particular area. However, six quarter hours of elective credit is the maximum which may be taken in any area of concentration.

Finance

- 44.901 Finance III — Advanced
Financial Management
- 44.921 Investment Analysis
- 44.923 Seminar in Strategies
for Growth Funding
- 44.925 Investment Management
of Financial Institution

Production

- 45.901 Production Process
Analysis & Techniques
- 45.902 Planning & Control of
Manufacturing Operations
- 45.911 Manufacturing Policy

Marketing

- 43.912 Dynamics of Marketing Management
- 43.921 Advertising Management
- 43.931 Marketing Research
- 43.941 Industrial Marketing
- 49.922 Marketing Information Systems

Human Relations

- 45.951 Executive Development
- 45.971 Industrial Relations I
- 45.972 Industrial Relations II

Economics

- 39.805 Business Cycles and Forecasting
- 39.823 Government Finance
- 39.825 Fiscal Policy
- 39.827 Economic Development
- 39.829 Comparative Economic Systems
- 39.831 Money and Banking
- 39.833 International Economics
- 39.835 Labor Economics

General Electives

- 45.957 Written Communications in Business
- 45.960 Organizational Theory in Industrial Practice
- 45.962 The Institutional Environment of Business I
- 45.963 American Business History
- 45.964 Institutional Environment of Business II
- 45.965 Management of Small Business Enterprises
- 45.966 Industrial Procurement and Materials Management
- 45.967 Management of Intangible Corporate Assets
- 45.969 Government and Business
- 45.983 Management Analysis and Decision-Making
- 45.985 Management of Research and Development
- 45.991 Business Law I
- 45.992 Business Law II
- 49.915 Management Information Systems I
- 49.916 Management Information Systems II
- 49.925 Principles and Methods of Business Research
- 49.932 The Computer and Its Application I
- 49.933 The Computer and Its Application II
- 49.952 Seminar in Capital Budgeting

Electives from Other Graduate Schools

Courses may also be selected from other programs of the Graduate Division at Northeastern University with the permission of the Director of the appropriate program and the Director of the Graduate School of Business Administration. For instance, students with the proper background may register in the Graduate School of Engineering for Operations Research for Management, Inventory Control and Production Planning, and other courses consistent with a program leading to the Master of Business Administration degree.

Transition Instructions for Former Students

In spite of changes in the program requirements which become effective in May 1968, students enrolled in the Master of Business Administration Program before that date, will fulfill degree requirements by completing the same program under which they originally enrolled. In most cases this is 40 or 42 quarter hours of graduate credit plus any prerequisite courses.

Cross Reference of Former Courses to New Courses

The following cross reference of new and former courses will aid the former student in deciding what courses are needed to complete his program.

Former Courses		New Courses	
Number	Course	Number	Course
41.800	Accounting for Managerial Control	41.811	Basics of Financial and Managerial Analysis
41.801	Control I	41.812	Profit Planning and Budgeted Systems Analysis
41.802	Control II	41.813	Planning, Decisions and Control Systems
43.801	Marketing I	43.811	Marketing Management I
43.802	Marketing II	43.812	Marketing Management II
44.801	Finance I	44.811	Financial Management I
44.802	Finance II	44.812	Financial Management II
45.801	Production I	45.805	Operations Management I
43.802	Marketing II	45.806	Operations Management II
45.811	Human Relations and Organizational Behavior I	45.815	Behavioral Concepts
45.812	Human Relations and Organizational Behavior II	45.816	Organizational Behavior I
45.821	Business Policy I	45.825	Business Policy I
45.822	Business Policy II	45.826	Business Policy II
39.805	Business Cycles and Forecasting	39.805	Business Cycles and Forecasting
49.910	Managerial Economic Analysis	49.901	Quantitative Economic Decision-Making I

DESCRIPTION OF COURSES

Required Courses

- 41.811 Basics of Financial and Managerial Analysis** Prep. None
An introduction to accounting systems, including the development of financial statements. Techniques which scrutinize the statements in order to evaluate the firm's potential in the light of historical data are critically appraised.
NOTE: It is recommended that the following text be read before the first class: **Essentials of Accounting** — Programmed Text, Robert N. Anthony.
- 41.812 Profit Planning and Budgeted Systems Analysis** Prep. 41.811,
Basics of Financial and Managerial Analysis
After examining the role which profit maximization plays as an entity objective, alternative courses of action for good achievement are integrated into a programmed budgeting process. Emphasis is given to the budget as a planning, motivating, coordinating, evaluating, and replanning device.
- 41.813 Planning, Decisions and Control Systems** Prep. 41.812,
Profit Planning and Budgeted Systems Analysis; or
41.814, Analysis, Planning and Control Systems
A study of the integration and coordination of short-range programs with long-range plans and the control mechanisms which enhance appropriate conformance to the strategic budget.
- 41.814 Analysis, Planning and Control Systems** Prep. None
The content of this course is essentially the same as 41.811 and 41.812
NOTE: It is recommended that the following text be read before the first class: **Essentials of Accounting** — Programmed Text, Robert N. Anthony.
- 43.811 Marketing Management I** Prep. 49.919,
Economic, Behavioral, and Environmental Determinants of Demand
The objectives of Marketing Management I and II are twofold: to provide the student with a comprehensive understanding of basic marketing functions, institutions, and concepts; and to develop the student's ability to analyze and make recommendations about business problems that involve the creation, distribution, and sale of goods and services. Marketing Management I emphasizes product policy, channels of distribution, and pricing.
- 43.812 Marketing Management II** Prep. 43.811
A continuation of Marketing Management I, with emphasis on advertising, personal selling, sales promotion, and the development of integrated marketing programs of action.
- 43.813 Marketing Management** Prep. 49.919,
Economic, Behavioral, and Environmental Determinants of Demand
The content of this course is essentially the same as 43.811 and 43.812.
- 44.811 Financial Management I** Prep. 41.813,
Planning, Decisions and Control Systems
The broad economic environment in which the business firm operates, including activities related to savings and investments and the creation, pricing,

and flow of profits in the national economy, is examined. Next, the major financial characteristics of business enterprises pertaining to their ability to earn profits and their capital costs are conceptually investigated. Finally, the strategies and techniques for managing the financial functions of the firm are practiced, with stress upon the factor of risk in financial analysis and decision-making.

44.812 Financial Management II

Prep. 44.811

Finance in relation to other business management functions is emphasized. Advanced techniques of financial analysis and decision-making, including unresolved areas of financial theory and practice, are investigated and tested against business case situations. Evening students are required to prepare a term report, based on data gathered on their jobs and/or from financial literature, which demonstrates thorough understanding of the financial aspects of a single management problem.

44.813 Financial Management

Prep. 41.814,

Analysis, Planning and Control Systems

The content of this course is essentially the same as 44.811 and 44.812.

45.805 Operations Management I

Prep. 49.902,

Quantitative Economic Decision-Making II

The study of operations as an integrated system responding to the firm's goals and objectives. Explores from a manager's viewpoint (1) the nature of the short-and long-range problems generated within operations; (2) factors in plant layout and the firm's physical facilities; and (3) the cost-data required for decisions about the productive process; including capital costs and investment criteria. Topics covered include: management's function in operations-system design, process planning, automation, work methods, job structure, job enlargement, and participation. Text and cases are used.

45.806 Operations Management II

Prep. 45.805

Continuation of the study of management of operations, exploring (1) the utility of standards and work measurement; (2) usefulness of operations control of various analytical techniques, such as waiting line theory, simulation and linear programming; and (3) the operation and control of the productive system. Topics covered include: management of inventory control, production-inventory systems, maintenance, quality, and improvement of operations cost. Text and cases are used.

45.807 Operations Management

Prep. 49.902,

Quantitative Economic Decision-Making II

The content of this course is essentially the same as 45.805 and 45.806.

45.815 Behavioral Concepts

Prep. None

This course entails a brief examination of major concepts and findings of the behavioral sciences which have particular relevance to business and administration. Systematic ways of understanding behavior will be developed taking account of both technical and human factors involved. Individual development will be studied from the standpoint of character, perception and learning, and motivation. Behavior of people in small groups will be

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examined in terms of the structure and dynamics of the group itself and of the individuals to the group.

45.816 Organizational Behavior I Prep. 45.815, Behavioral Concepts
Basic findings and concepts of the behavioral sciences will be related to the specific aspects of behavior in formally constituted organizations. Supervisory behavior will be examined in the behavioral context. Relations between groups will be examined with the objective of developing ways to achieve collaboration. Finally, the study of behavior in organizations will be expanded to larger organizations in order to understand and deal systematically with the complex relationships found at this level.

45.817 Organizational Behavior II Prep. 45.816 or 45.818, Organizational Behavior
This final course of the required three-course sequence in behavioral science will provide an opportunity to apply knowledge about people in organizations to the improvement of organizational systems and to the processes of achieving changes in organizations. The course will emphasize the skill of the student in relating behavior concepts and knowledge to the change process.

45.818 Organizational Behavior Prep. None
The content of this course is essentially the same as 45.815 and 45.816.

45.825 Business Policy I Prep. All other required courses except 45.987, Strategic Planning — Business Game, and 49.918, Information Theory and Systems
An understanding of corporate strategy and its elements including an analysis of the company, its resources and opportunities, its environment, and its decision-makers. The first course in Policy will be concerned primarily with the process of analyzing an overall company situation, with emphasis on internal resources and external opportunities.

45.826 Business Policy II Prep. 45.825
A continuation of Business Policy I, with further emphasis on objectives, both corporate and personal, as major elements of corporate strategy. More emphasis on decision-making and implementation of strategy, building upon analytical work of Policy I.

45.827 Business Policy Prep. All other required courses except 45.987, Strategic Planning — Business Game, and 49.918, Organizational Behavior
The content of this course is essentially the same as 45.825 and 45.826.

45.987 Strategic Planning — Business Game Prep. All other required courses
Based on a Business Management Computer game in which the student becomes a member of the management team of a manufacturing company, simulated in Northeastern's computer center, and is given responsibility for decision-making in a competitive environment. The relationships between marketing, finance, manufacturing, and business policy are clarified. Readings and lectures supplement the decision-making exercise.

- 49.901 Quantitative Economic Decision-Making I** Prep. None
 QED I establishes the economic foundation and framework within which specific quantitative tools designed to facilitate decision-making will be developed. Topics developed include an evaluation of the profit maximization criterion; the marginalist concept; relevant costs; cost analysis and pricing policies; forecasting; regression and correlation analysis; linear programming; and an introduction into decision-making under uncertainty.
- 49.902 Quantitative Economic Decision-Making II** Prep. 49.901
 QED II covers decision-making under uncertainty, utilizing the basic concepts of statistical decision making to solve practical business problems. Topics covered include: decision-tree diagrams; cash flow; preference (utility theory); construction; use and approximation of probability distributions; conditionality; bayesian analysis; and use of sampling information.
- 49.903 Quantitative Economic Decision-Making III** Prep. 49.902
 QED III covers special topics in quantitative analysis. Emphasis will be placed on use of these techniques in business situations. Topics covered include: linear programming (special topics); PERT and CPM; dynamic programming; game theory; queuing theory; inventory theory; simulation (computer programming, Monte Carlo technique, and formulation of decision rules).
- 49.918 Information Theory and Systems** Prep. 41.813, Planning Decisions and Control Systems, and 49.902, Quantitative Economic Decision-Making II
 The objective of this course is to develop a framework for the analysis of communication and information systems in organizations. Aspects of communications theory are studied as background for building this framework. Through the analysis of case studies, the adequacy of the analytic framework and its underlying theory is tested.
 Topics will include development of a framework for analysis for viewing information systems and communication in organizations. Various aspects of communications theory will be discussed and analyzed. A major objective of the communications and informations flow in organizations, and to tie these events back to the underlying theory.
- 49.919 Economic Behavioral and Environmental Determinants of Demand** Prep. None
 An examination of the various external forces — economic, behavioral, social, technological, competitive, political — which create and shape demand for goods and services. Research techniques useful in measuring and predicting demand are considered. Cases are utilized to allow students to analyze, from the point of view of a particular firm or industry, the effects of external forces on the demand for their products; and also to consider the actions that might be taken by a firm or industry to influence demand. Supplementary readings are used to provide concepts, techniques, and knowledge useful in understanding the dynamics of demand.

Elective Courses

All courses carry two quarter hours of credit unless otherwise specified.

ECONOMICS

- 39.805 Business Cycles and Forecasting** Prep. None
 The theory of models is used to show that the business phenomenon varies in accordance with the economic and social system implied, and that there is an economic model (the Walrasian system) where the phenomenon cannot exist, at least not in the form that we know from the history of modern capitalism. The major business-cycle theories are introduced for the purpose of demonstrating their application in forging consistent and efficient policies. A statistical theory of fluctuations in business activity of the United States forms the background for a judgment on policies and their effectiveness.
- 39.823 Government Finance** Prep. None
 A survey of governmental expenditure, revenue, and debt systems, with emphasis upon their economic effects and their relationships to principles of economic welfare. Discussions on taxation, tax incidence, tax theory, debt management, and employment levels.
- 39.825 Fiscal Policy** Prep. 39.823, Government Finance or equivalent
 Deliberate adjustments in revenues and expenditures for the purpose of obtaining greater economic stability and economic growth. Discussion on neutral fiscal policy, built-in stabilizers, budget management, attainment of full employment, inflation, and deflation.
- 39.827 Economic Development** Prep. None
 The enumeration, delineation, and assessment of variables which determine the level and the nature of economic activity. An introductory discussion of the economic factor in civilization is followed by an examination of the psychological, social, and political influences on economic change. The role of various economic institutions in secular development is analyzed.
- 39.829 Comparative Economic Systems** Prep. None
 A comparative study of central economic theories and institutions of Capitalism, Socialism, Communism, Welfare State. Particular attention to criteria for evaluating success in meeting diverse goals, techniques and problems of planning, and real growth rates. Some attention paid to primitive economics.
- 39.831 Money and Banking** Prep. None
 The necessary information for an understanding of the nature and functioning of the monetary and banking system of the United States as well as of any other country of the modern era. The theory of models is used to show how many monetary and banking systems are possible, and how the solution to a given problem (both in theory and practice) depends on the model selected. Thus, in a scientific treatment, theory and policies are interrelated in the same sense that a good practical solution has to rely upon good analysis. Monetary issues of international nature are discussed.

39.833 International Economics Prep. 39.831, Money and Banking or equivalent

The historical background of the Balance of International Payments of the United States. To understand the nature of the problems in this field, central attention is given to the theory of international trade and capital movements. Further attention is paid to the interpretation and evaluation of the various possible foreign economic policies. Trade agreements and restrictions are also included as a part of the greater issues of international economic development and cooperation.

39.835 Labor Economics Prep. None

The economics of wage determination, impact of unions on wages and inflation, the economics of full employment and unemployment, and private and public remedial policies; the labor force, government labor legislation, security, unionism, and democracy.

MARKETING

43.912 Dynamics of Marketing Management Prep. 43.812, Marketing Management II, or 43.813, Marketing Management

A capstone marketing course which focuses on the marketing executive's task of interrelating the various functional activities within his department and integrating the resulting marketing programs with the short- and long-term objectives of the firm. Case studies and supplementary readings.

43.921 Advertising Management Prep. 43.812, Marketing Management II, or 43.813, Marketing Management

The ability of advertising to contribute — in large or small measure — to marketing in a variety of business situations. Examined from a top management point of view. The student is faced with the problem of formulating marketing problems with appropriate emphasis upon advertising. Case analyses and discussions, supplemented by background readings.

43.931 Marketing Research Prep. 43.812, Marketing Management II, or 43.813, Marketing Management

The major methods and models of marketing research are examined in order to give line user an understanding of the function of research in decision-making. Specific topics include marketing research as a system of information; information from surveys, information from experiments, economic value of information, sales forecasting and control, and selected applications. Cases, problems, and research project.

43.941 Industrial Marketing Prep. 43.812, Marketing Management II, or 43.813, Marketing Management

The problems of industrial concerns in selling their products and services to other industrial customers are studied, first at the salesman's level, then at the area manager's level, and finally at the level of the company sales executive. Emphasis is placed on determining the customer's needs and finding ways to meet these needs. Areas covered include the role of the purchasing agent, and the problems of the supervisor and the industrial salesman.

- 49.922 Marketing Information Systems** Prep. 43.812,
Marketing Management II, or 43.813, Marketing Management
The purpose of this seminar is to examine the theoretical concepts, empirical research, and practical applications of information systems in marketing. A few lectures are given on basic concepts. Individual studies are prepared by the members of the seminar on subsystems such as forecasting, sales control, input-output analysis, consumer models, and the concept of total systems. These studies are followed by oral reports and group discussions.

FINANCE

- 44.901 Finance III — Advanced Financial Management** Prep. 44.812,
Financial Management II, or 44.813, Financial Management
An opportunity to study several important areas of financial management in greater depth than was possible in the basic finance courses. Some of the topics are corporate capital structure, dividend policy, capital budgeting, and the management of current assets. Instruction is primarily through assigned readings and classroom case discussions.
- 44.921 Investment Analysis** Prep. 44.812, Financial Management II,
or 44.813, Financial Management
Investment principles and risks. The objective will be the development of a sound investment program with attention being given to identification of investment objectives and risks. Emphasis will be placed on the techniques of analysis and evaluation of various types of securities and the associated risks, the operation of the securities markets, and the various methods of portfolio management.
- 44.923 Seminar in Strategies for Growth Funding** Prep. 44.812,
Financial Management II, or 44.813, Financial Management
A course with a narrowed scope dealing, in depth, with concepts and practices of designing capital structures to accommodate corporate growth. The planning and implementations of funding actions is becoming as complex and as necessary to corporate success as the conception, engineering, and production of quality products. Published and unpublished research material will be utilized along with classroom discussions of published cases and of "live cases" presentations by visiting practitioners. The purpose of the course is to increase our understanding of management's opportunities to influence the supply of financial resources available.
- 44.925 Investment Management of Financial Institutions** Prep. 41.813,
Planning, Decision and Control Systems; and 44.812,
Financial Management II, or 44.813, Financial Management
Investment principles as they relate to commercial banks, savings banks, insurance companies, finance companies, investment companies, endowments and trusts. Emphasis is on the influence of business conditions, fiscal and monetary policy, and general government economic policy on institutional liabilities related to assumption of risk, the evaluation of risk, and development of lending and investment policies for various institutions. Readings and case studies are used.

PRODUCTION

- 45.901 Production Process Analysis and Techniques** Prep. 45.806,
Operations Management II, or 45.807, Operations Management

The resolution of tractable production-management problems identified through process analysis. The student should develop skill in process analysis and the ability to evaluate analytical concepts and techniques. Topics covered include the identification of complex economic and technological factors in a firm's environment. Production-management readings and cases are used.

- 45.902 Planning and Control of Manufacturing Operations** Prep. 45.806,
Operations Management II, or 45.807, Operations Management

Cases and reading assignments deal with day-to-day problems of the factory manager, the middle-management group, and the front-line supervisor. Each case presents a specific problem for which a definite solution must be reached, often within a time limit. Emphasis is placed on solving immediate problems within the framework of existing policies by coordinating the resources at hand. Cases and readings are used.

- 45.911 Manufacturing Policy I** Prep. 45.806,
Operations Management II, or 45.807, Operations Management

The functional interrelationship of major manufacturing decisions facing management. Exploration of the nature of situations of such scale and complexity that the total production resources of the firm must be considered together with financial, marketing, competitive, and other policy elements to arrive at a decision. Provides skill in the analysis of the production process, useful to the manufacturing vice president or the investment analyst who must consider the total industry for major company decisions. Text and cases are used.

HUMAN RELATIONS

- 45.95i Executive Development** Prep. 45.817, Organizational Behavior II

The executive and the organizational and personal situation in which he must be equipped to function. Theory of leadership, experiment in established development techniques, practice in individual and group improvement methods. Management by objectives, group dynamics, case, incident, and conference method are reviewed. Coaching performance appraisal, interviewing, reading, listening, and report writing are analyzed as essentials of executive development and achievement.

- 45.971 Industrial Relations I** Prep. 45.817, Organizational Behavior II

Significant developments of industrial relations and employment theory; the principles of personnel management and of management-union relations; policy considerations for the managing of manpower resources; policy impact of current developments in work theory, in staffing, in training and development in compensation and benefit programs. Communications and morale; theoretical and case discussion.

45.972 Industrial Relations II

Prep. 45.971,

Industrial Relations I or equivalent

Labor policy in relation to management unions and the public; management-union relations as joint control over human resources of organizations, private and public; the labor movement and collective bargaining; work rules and productivity; labor disputes and supplements to negotiations; political and economic power; legal responsibilities of labor and management; management authority, employee discipline; types of management-union relations. Theories and cases.

General Electives

45.957 Written Communications in Business

Prep. None

How to write business reports with clarity and coherence. Review of the rules of grammar; usage, style, and structure; collective criticism of students' papers and other writings; written analyses of cases; and critical evaluations of important books in the literature of business administration. One paper a week is normally required.

45.960 Organizational Theory in Industrial Practice

Prep. 41.811,

Basics of Financial and Managerial Analysis, or 41.814,

Analysis, Planning and Control Systems

An analysis of the statics and dynamics of organization structure and behavior. Beginning with a study of such organization concepts as hierarchy, specialization, and authority, the course proceeds to examine a variety of external and internal forces which impinge on organization, frequently demanding change in organization itself. Indeed, a measure of organizational effectiveness may well be its alertness in responding to the requirements and opportunities in its external environment, at the same time maintaining an organization climate which is sensitive to the internal demands placed upon it.

Within this broad conceptual scheme and using selected readings, company histories and case analyses, the following kinds of questions will be explored: What external and internal forces may demand change in organizations? What is the nature of these forces for change? Do they conflict or mutually reinforce one another? How is the need for change recognized and translated into new organizational forms?

45.962 The Institutional Environment of Business I

Prep. 10 Quarter

Hours of Graduate Credit

The relationship of the business corporation to various elements in its environment; political, social, economic, scientific, and educational. Developing interactions and mutual responsibilities, with emphasis on initiating and planning to affect these external institutional relations rather than only to react. Responsibilities of business and of businessmen.

45.963 American Business History

Prep. None

Religion and the rise of capitalism, the Industrial Revolution, theories of American economic growth, the influence of the frontier on the American economy, the rise of big business, the gilded age, the role of the entrepreneur, the development of the corporation, and changing relations be-

tween business and labor. Lectures, class discussions, and written evaluations of important writings in the field.

45.964 The Institutional Environment of Business II Prep. 45.962

Further examination of the relations of business with its environmental influence; the responsibilities of the businessman and the firm to external and internal interests in a dynamic and pluralistic system. Emphasis on situations involving conflicting values and personal, organizational, moral and public interest, with role-playing to allow student participation in corporate conflict determination.

45.965 Management of Small Business Enterprises Prep. 41.811,

Basics of Financial and Managerial Analysis, or 41.814,
Analysis, Planning and Control Systems, and at least one course
in the areas of Finance, Marketing, and Operations Management

Problems in various phases of the management of a new small business. An appraisal of risk as well as reward is made for business opportunities. Problems range from locating, evaluating, and financing a small business to those of survival and growth in a going concern.

45.966 Industrial Procurement and Materials Management Prep. 41.811,

Basics of Financial and Managerial Analysis, or 41.814,
Analysis, Planning and Control Systems

The management of production materials and inventory, with special reference to procurement of the materials involved. Text and cases are used.

45.967 Management of Intangible Corporate Assets Prep. 43.812,

Marketing Management II, or 43.813, Marketing Management

Non-operating profit income possibilities from research and development (commercial and industrial); definition of intrinsic value; uses of business know-how; trade secrets; industrial intellectual property; government-contract data problems in establishing second-source vendors; copyright income; use of intellectual business property as vehicle for market penetration of new business development through licensing agreements; maximum utilization of corporate tangible resources to improve the profit picture; analytical investigation of selected companies through seminar approach.

45.969 Government and Business Prep. None

The expanding scope of the government's economic and socio-economic activities is bringing about a much closer relationship between government and business. The course analyzes the role of government as a regulating force, as well as the nature and impact of government fiscal, economic, and socio-economic policies upon the conduct of business. The political and economic philosophies behind greater government participation in the economic structure of the nation as indicated by public-utility, antitrust, labor, and socio-economic legislation.

45.983 Management Analysis and Decision-Making 4 Q.H.

Prep. 41.811, Basics of Financial and Managerial Analysis,
or 41.814, Analysis, Planning and Control Systems

The decision-making process within the broad business environment. Case analysis will be the basic means through which this process is examined.

The case facts and their relationships to problems and issues shall be considered in making decisions. The reasoning and considerations that affect a decision are to be communicated by means of written expression. Therefore, a well-organized and considered written analysis will result from a logical approach to decision-making.

45.985 Management of Research and Development Prep. 41.811, Basics of Financial and Managerial Analysis, or 41.814, Analysis, Planning and Control Systems

Some corporations grow more rapidly than their competitors. This is due, for the most part, to better management of their technical programs. This course focuses on the unique problems of R & D Management through readings and case studies which bring out the important considerations involved in (1) dealing with scientists and engineers as individuals, (2) planning, organizing, and controlling research, (3) staffing and compensating scientists, and (4) establishing a climate for research.

45.991 Business Law I Prep. 41.811, Basics of Financial and Managerial Analysis, or 41.814, Analysis, Planning and Control Systems

With the legal form of the business organization as a focal point — proprietorship, partnership, corporation — the course examines the legal problems concerning the organization, the long-term financing, the acquisition of property, and the sales functions of the various entities in such a way that the legal and financial aspects are continuously related as the businessman encounters them. The Uniform Commercial Code is emphasized throughout the course.

45.992 Business Law II Prep. 41.811, Basics of Financial and Managerial Analysis, or 41.814, Analysis, Planning and Control Systems

The legal and financial principles of short-term financing, with particular reference to Article 3 and 9 of the Uniform Commercial Code; the regulatory laws which influence and determine business practices and competition; and the adjustment of a debtor's financial problems both outside the courts and through bankruptcy and rehabilitation proceedings in the federal courts.

49.915 Management Information Systems I Prep. 10 Quarter Hours of Graduate Credit

The objective is to help the student develop a new context in which management information systems (MIS) — past, present and future — can be viewed in clear perspective. The management-science approach emphasizes the importance of dynamic patterns of behavior which determine the success of any enterprise. The closed-loop feedback structures which determine such patterns are analyzed. Even though the student has no knowledge of computers, he progresses to the point where he can begin to evaluate possible changes in any given management information systems. Class discussions are based on individual experiences, case studies, and reading assignments.

49.916 Management Information Systems II Prep. 49.915

Student simulation of closed-loop management systems will provide a basis for demonstrating the controlling characteristics of dynamic response-patterns in any enterprise. Based on the philosophy, techniques, and structures developed in MIS I, selected classes of changes in system-parameters

and structures will be studied. No computer skill is required for the student to operate in his role of manager, experimenting with his organization and its environment. Marginal utilities of investments are measured quantitatively as they bear upon alternative management objectives. Explicit treatments of management perceptions, psychological parameters, time delays, and random fluctuations or errors are included.

49.925 Principles and Methods of Business Research Prep. None

A major objective of the course is to present business research from an operational approach, applying the logic of the research procedure to the investigation and solution of business problems. Methodology is studied, discussed, and implemented in detail and from an overall conceptual point of view.

Writing techniques, statistical techniques, report format, and the like are discussed, and a report is generally required.

49.932 The Computer and Its Applications I Prep. College Algebra

The development of familiarity with the computer and an understanding of its increasingly vital role in solving management problems. Introduction to the computer: hardware, software, and basic concepts of operation. A detailed study of programming language to develop the student's ability to solve problems directly on the computer.

The lectures will be primarily divided into two parts: (1) a survey of the general management problems that are adaptable to the computer and (2) some statistical applications of computer programming. Towards the end of the term, students are expected to write a paper about computer applications in business and to write simple problems which can be programmed.

49.933 The Computer and Its Applications II Prep. 49.932,
The Computer and Its Applications I

The course will deal in depth with specific management-science problems, including linear programming, inventory control and PERT CPM. To prepare students for an understanding of the above problems and their solutions on computers, the course will cover the required basic principles of linear algebra and vector analysis.

All math concepts used will be thoroughly explored, and all problems will be programmed. Students will be expected to write an essay covering in-depth analysis of a particular or management science problem and to be able to program the solution in such a way that it can be run on the computer.

49.952 Seminar in Capital Budgeting Prep. 41.813, Planning, Decision,
and Control Systems; and 44.812, Financial Management II,
or 44.813, Financial Management

A course with a narrow scope dealing in depth with the managerial and financial problems concerning the allocation of corporate resources to long-term uses within the firm. The problems to be considered include the encouragement of the development of investment opportunities, as well as systems and techniques for their evaluation and selection. The goal of the course is to enhance the individual's ability to affect the selection of investment opportunities in a way which will make a maximum contribution to the development of the firm.

UNDERGRADUATE UNIVERSITIES ATTENDED BY STUDENTS ENTERING IN SEPTEMBER 1968

Amherst College	Merrimack College
Atlantic Union College	New Hampshire, University of
Bandrus Hindu University (India)	Newark College of Engineering
Bates College	Northeastern University
Bentley College	Northwestern University
Boston College	Norwich University
Boston University	Notre Dame, University of
Bowdoin College	Ohio State University
Brandeis University	Ohio Wesleyan University
Bridgeport, University of	Omaha, University of
Brooklyn College	Pennsylvania State University
Brooklyn Polytechnical Institute	Portland, University of
Brown University	Princeton University
Bryant College	Providence College
Bucknell University	Purdue University
California, University of	Queens College
Calvin College	Regis College
Canisius College	Rensselaer Polytechnic Institute
Case Institute of Technology	Rhode Island, University of
Catholic University (Venezuela)	Rutgers University
Cincinnati, University of	St. Lawrence University
City College of New York	St. Michael's College
Connecticut, University of	San Jose State College
Cornell University	Southeastern Massachusetts
Dartmouth College	Technological Institute
Fisk College	Southern California, University of
George Washington University	State College at Boston
Harvard University	(Massachusetts)
Houston, University of	State College at Salem
Howard University	(Massachusetts)
Illinois, University of	Suffolk University
Ithaca College	Swindon Institute of Technology
Kansas, University of	(England)
Kenyon College	Temple University
Lake Forest College	Tennessee Technological University
LaSalle University	Texas, University of
Lehigh University	Tufts University
Louisville, University of	United States Coast Guard Academy
Lowell Institute of Technology	United States Merchant Marine
Maine, University of	Academy
Marietta College	United States Military Academy
Maryknoll College	United States Naval Academy
Maryland, University of	Vermont, University of
Massachusetts Institute of Technology	Wellesley College
Massachusetts Maritime Academy	Wisconsin, University of
Massachusetts, University of	Worcester Polytechnic Institute
McGill University (Canada)	Yale University

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**NORTHEASTERN
UNIVERSITY**



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**graduate school
of
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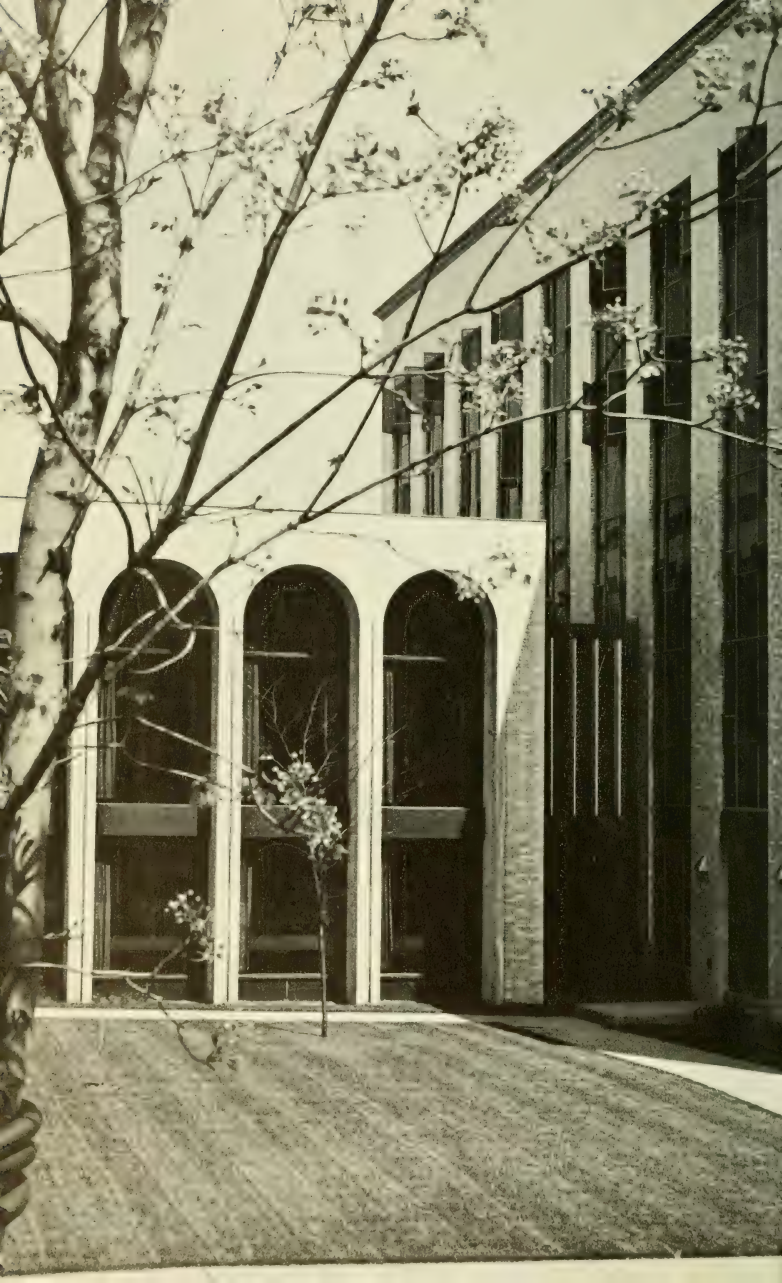


NORTHEASTERN UNIVERSITY
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PLAN OF
NORTHEASTERN UNIVERSITY
BOSTON, MASSACHUSETTS

ACADEMIC CALENDAR YEAR 1968-1969

Summer Session 1968

Registration Period for Former Students	Monday-Friday	May 27-June 7
Huntington Campus		
Mon. 1-5, 6-9 p.m.		
Tues.-Fri. 1-4 p.m.		
Burlington Campus		
Mon. 1-5, 6-9 p.m.		
Tues.-Fri. 9 a.m.-4:30 p.m.		
Appointments for interviews for NEW students must be made by	Wednesday	May 29
Interview and Registration Period for New Students	Monday-Friday	June 3-June 7
Huntington Campus		
Mon. 1-5, 6-9 p.m.		
Tues.-Fri. 9 a.m.-4 p.m.		
Burlington Campus		
Mon. ONLY 1-5, 6-9 p.m.		
Classes Begin	Monday	June 24
Independence Day, No Classes	Thursday	July 4
Classes End	Tuesday	July 30
Examination Period	Wednesday-Saturday	July 31-Aug. 3

Fall Quarter 1968*

Registration Period for Former Students	Monday-Saturday	Aug. 12-Aug. 31
Interview and Registration Period for New Students**	Monday-Saturday	Aug. 19-Sept. 7
Classes Begin	Monday	Sept. 16
Columbus Day, No Classes	Saturday	Oct. 12
Veterans' Day, No Classes	Monday	Nov. 11
Thanksgiving Recess, No Classes	Tuesday-Friday	Nov. 26-29
Examination Period***	Monday-Friday	Dec. 2-6

Winter Quarter 1968-69

Change for Registration for Former Students	Wednesday-Wednesday	Nov. 20-Nov. 27
Interview and Registration Period for New Students**	Wednesday-Wednesday	Nov. 20-Nov. 27
Classes Begin	Monday	Dec. 9
Christmas Vacation, No Classes	Saturday-Wednesday	Dec. 21-Jan. 1
Washington's Birthday, No Classes	Saturday	Feb. 22
Examination Period	Monday-Friday	March 3-March 7

Spring Quarter 1969

Change of Registration for Former Students	Monday-Friday	Feb. 24-Feb. 28
Classes Begin	Monday	March 17
Patriots' Day, No Classes	Saturday	Apr. 19
Final Grades due in Registrar's Office for June Graduates Taking Third-Quarter Courses	Friday	May 23
Memorial Day, No Classes	Friday	May 30
Examination Period	Monday-Friday	June 2-June 6

*Students who expect to receive a degree in June 1969 should file a commencement card at the time of registration for the Fall Quarter, or no later than April 1.

**Appointments for interviews with new students must be made at least one week before the date of the interview.

***Examinations for day classes will be held in accordance with the undergraduate examination schedule.

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Joseph M. Golemme, B.S., M.A., C.P.A.	Director of the Graduate School of Professional Accounting
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John W. Jordan, B.S., M.Ed.	Administrative Assistant in Business Administration
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Joseph A. Ross, B.S. Ed.	Administrative Assistant in the Graduate Division
Richard E. Sprague, B.S., B.B.A., M.B.A., Ed.M.	Administrative Assistant in the Graduate Division
Arthur A. Vernon, B.S., M.S., Ph.D.	Dean of the Graduate Division and Director of the Graduate School of Arts and Sciences
Janice Walker, A.B.	Registrar of the Graduate Division
Carol A. Weiss, A.B.	Administrative Assistant in the Graduate School of Education

UNIVERSITY GRADUATE COUNCIL

1967-68

The responsibility of the Council is the determination of broad policies and regulations governing the conduct of graduate work. All new graduate programs must be approved by the Council.

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Geoffrey Crofts	Dean of the Graduate School of Actuarial Science
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Andre P. Priem	Director of the Graduate School of Business Administration
Kenneth G. Ryder	Vice President and Dean of Administration
Roy L. Wooldridge	Vice President and Dean of Cooperative Education

**Elected Faculty Members
(Terms Expire September 1968)**

Wendell R. Brown	Associate Professor of Social Science Education
John F. Dunn	Professor of Mechanical Engineering
George M. Krause	Professor of Pharmacy
Robert W. Mullins	Associate Professor of Management
Robert J. Minichiello	Associate Professor of Marketing
Harold R. Raemer	Professor of Electrical Engineering and Chairman of the Department
Raymond H. Robinson	Professor of History and Chairman of the Department
George B. Rochfort, Jr.	Associate Professor of Education
Elliot Spector	Professor of Pharmacology
A. Bertrand Warren	Professor of Psychology and Chairman of the Department

(Terms Expire September 1969)

James T. Barrs	Professor of English
Robert J. Ferullo	Associate Professor of Special Education
Austin W. Fisher	Professor of Engineering Management
Bernard M. Goodwin	Associate Professor of Chemical Engineering
Melvin Howards	Director of the Center for Educational Development
A. Howard Myers	Professor of Industrial Relations
John F. Reinhard	Professor of Pharmacology and Chairman of the Department
John N. Samaras	Associate Professor of Management
Robert A. Shepard	Professor of Chemistry and Chairman of the Department
Albert H. Soloway	Associate Professor of Medicinal Chemistry

Aims and Scope of the University

Founded in 1898, Northeastern University is incorporated as a privately endowed nonsectarian institution of higher learning under the General Laws of Massachusetts. The State Legislature by special enactment has given the University general degree-granting powers. The University is governed by a Board of Trustees elected by and from the Northeastern University Corporation, which is composed of more than 150 distinguished business and professional men.

From its beginning Northeastern University has had as its dominant purpose the discovery of community educational needs and the meeting of these in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has sought to pioneer new areas of educational service.

A distinctive feature of Northeastern University is its Cooperative Plan, initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922), Liberal Arts (1935), Education (1953), Pharmacy (1962), Nursing (1964), and Boston-Bouvé College (1964). This educational method enables students to gain valuable practical experience as an integral part of their college programs and also provides the means by which they may contribute substantially to the financing of their education. The Plan has been extended to the graduate level in engineering, mathematics, sociology, actuarial science, the pharmaceutical sciences, professional accounting, and business administration.

In the field of adult education, programs of study have been developed to meet a variety of needs. Since 1906 evening curricula have been offered leading to the bachelor's degree. Programs in the arts and sciences, engineering, various fields of business, law enforcement and security, and other areas have been carefully planned to serve mature students who are employed full time during the day and want to broaden their educational background by part-time study. All formal courses of

study leading to degrees through evening programs are approved by the Basic College faculties concerned and are subject to the same quantitative and qualitative standards as the regular day curricula.

The following is a brief outline of the aims and scope of the University's programs.

UNDERGRADUATE COLLEGES

BOSTON-BOUVÉ COLLEGE

Boston-Bouvé College offers three major programs of study: physical education and recreation education, both leading to the degree of Bachelor of Science in Education; and physical therapy, leading to the degree of Bachelor of Science in Physical Therapy.

The combined programs of liberal arts, science, and professional preparation include field experience and student teaching, and leadership training in camping and outdoor education at the Warren Center for Physical Education and Recreation in Ashland. In accordance with Northeastern's Cooperative Plan of Education, students are offered varied opportunities for alternate plans of work-study experience during upper-class years.

THE COLLEGE OF BUSINESS ADMINISTRATION

The College of Business Administration offers programs of study in the principal fields of business leading to the degree of Bachelor of Science in Business Administration. These programs are offered on the five-year Cooperative Plan, under which students gain substantial practical experience in the fields for which they are preparing as an integral part of their undergraduate course of study.

The College also sponsors a Management Institute which offers various special courses for business and industrial executives. One phase of the Institute's work is carried on by the Center for Management Development, which annually conducts an intensive program designed to provide professional growth for middle-management executives who will ultimately be called upon to carry broader executive responsibilities. The plan of instruction, based on a modification of the Northeastern Cooperative Program, permits the participants to maintain their job responsibilities during the six-month period of the course. The Management Development Program is conducted at Andover, Massachusetts, on the campus of Andover Academy.

A Bureau of Business and Economic Research, concerned particularly with problems of the New England region, is an integral part of the College. The Bureau conducts research projects under faculty leadership using undergraduate and graduate cooperative students as research assistants.

COLLEGE OF CRIMINAL JUSTICE

The College of Criminal Justice offers full-time day curricula on the Cooperative Plan leading to the degree of Bachelor of Arts with concentration in the field of law enforcement.

THE COLLEGE OF EDUCATION

The College of Education offers programs leading to the degree of Bachelor of Science in Education. These are designed particularly to meet the needs of high school graduates who desire to prepare themselves for teaching or administrative positions in elementary and secondary schools. Curricula are offered on the five-year Cooperative Plan, which provides for employment in libraries, social service agencies, and school systems.

THE COLLEGE OF ENGINEERING

The College of Engineering offers five-year cooperative curricula in civil, mechanical, electrical, chemical, industrial, and biomedical engineering leading to the degree of Bachelor of Science with specification according to the engineering department in which the student qualifies. A six-year program in power systems engineering in collaboration with public utilities leads to both the bachelor's and master's degree in electrical engineering. The College also offers during evening hours a part-time program leading to the degree of Bachelor of Science in Electrical Engineering. This program extends over eight years, covers the identical courses given in the day cooperative curriculum, and meets the same qualitative and quantitative standards of scholarship.

THE COLLEGE OF LIBERAL ARTS

The College of Liberal Arts offers majors in the usual field of the arts and sciences leading to the degree of Bachelor of Arts. With the exception of preprofessional programs, curricula are normally five years in length and operated on the Cooperative Plan.

LINCOLN COLLEGE

Lincoln College offers technology programs leading to the Associate in Engineering and Bachelor of Engineering Technology degrees. It also offers science technology and paramedical technology programs leading to the Associate in Science degree.

In addition to its traditional curricula, Lincoln College offers interdisciplinary and certificate programs providing technological and professional

development opportunities to meet the special needs of part-time students.

THE COLLEGE OF NURSING

The College of Nursing offers two separate and distinct programs of study, both organized on the Cooperative Plan:

- (a) A three-year curriculum in preparation for the R.N. Examinations and leading to the Associate in Science degree.
- (b) A five-year curriculum also preparing students for the R.N. Examinations, and leading to the degree of Bachelor of Science in Nursing.

Five of Boston's leading hospitals — Beth Israel, Children's Hospital Medical Center, New England Deaconess, Peter Bent Brigham, and Massachusetts General — collaborate with Northeastern by providing suitable cooperative work opportunities during the upper-class years of these programs.

THE COLLEGE OF PHARMACY

The College of Pharmacy offers five-year cooperative curricula leading to the degree of Bachelor of Science in Pharmacy. Cooperative placement begins with the sophomore year and continues for three years, the senior year being devoted to full-time study at the University.

UNIVERSITY COLLEGE

University College, so called because it draws upon the resources of the other colleges of the University, offers courses of study leading to certificates, Associate in Science and Bachelor of Science degrees. University College offers both day and evening programs designed specifically to meet the needs of adult students who wish to undertake part-time curricula during late afternoon or evening hours and on Saturdays. In cooperation with the Forsyth School for Dental Hygienists, University College offers a two-year day curriculum leading to the Associate in Science degree.

Quality standards of instruction and requirements for the degrees offered by University College are wholly consistent with those of the other colleges of the University. University College does not duplicate the offerings of the eight Basic Colleges but provides curricula which cut across traditional subject-matter areas to meet the particular needs of adults desiring formal programs of professional development on a part-time basis, or of young people enrolled in professional schools affiliated with Northeastern University.

GRADUATE AND PROFESSIONAL SCHOOLS

ACTUARIAL SCIENCE

Master of Science in Actuarial Science.

ARTS AND SCIENCES

Master of Arts, Master of Science, Doctor of Philosophy.

BUSINESS ADMINISTRATION

Master of Business Administration.

EDUCATION

Master of Education.

ENGINEERING

Master of Science with course specification, including a special six-year program in power systems engineering leading to both bachelor's and master's degrees in Electrical Engineering; a similar six-year program in mechanical engineering leading to both bachelor's and master's degrees; and Doctor of Philosophy degree in the fields of Electrical, Chemical, and Mechanical Engineering.

LAW

Juris Doctor.

PHARMACEUTICAL SCIENCES

Master of Science with specialization in hospital pharmacy, industrial pharmacy, medicinal chemistry, and pharmacology.

PROFESSIONAL ACCOUNTING

A five-quarter curriculum leading to the degree of Master of Science in Accounting.

Some of these programs are offered on the Cooperative Plan; others provide teaching and research fellowships for able candidates. Administrative headquarters for all graduate programs are located in Churchill Hall.

CENTER FOR CONTINUING EDUCATION

The Center for Continuing Education was established to relate the University to the needs of its community in a period of accelerated change. Its programs are composed of seminars, conferences, institutes, forums, and a wide variety of special courses designed to serve specific needs. The Division of Special Programs, working cooperatively with trade associations and professional societies, offers a wide variety of programs dealing with current needs and problems. Through its Division of Community Services, working with governmental agencies and community organizations, the Center is becoming increasingly involved in social problems on both the local and national level.

Many of these programs are conducted at Henderson House, Northeastern University's conference center in Weston, Massachusetts.

AFFILIATED PROGRAMS

FOR DENTAL HYGIENISTS

The Forsyth School for Dental Hygienists conducts a two-year program of dental hygiene education and general education in cooperation with Northeastern University. Graduates of the program receive the Certificate in Dental Hygiene from Forsyth and the degree of Associate in Science from Northeastern.

FOR MEDICAL TECHNOLOGISTS

In cooperation with the New England Baptist and the New England Deaconess Hospitals, Northeastern University offers a full-time day program on the Cooperative Plan leading to the degree of Bachelor of Arts.

FOR NURSES

Northeastern University offers instruction in the sciences, humanities, and social studies for student nurses from the New England Deaconess and Children's Hospital Medical Center Schools of Nursing.

RESEARCH ACTIVITIES

The faculties of the University are engaged in a wide variety of basic research projects in business, science, social science, pharmacy, and engineering. These are coordinated by the Dean of Research, whose services are University-wide and available to the faculties of all the Colleges.

Although Northeastern is primarily concerned with undergraduate and graduate instruction, the University believes that the most effective teaching and learning takes place in an environment characterized by research activities directed toward extending the frontiers of knowledge.



Buildings and Facilities

LOCATION OF MAIN CAMPUS

The main campus of Northeastern University is located at 360 Huntington Avenue in the Back Bay section of Boston. Many of the city's famous cultural, educational, and philanthropic institutions are situated in the Back Bay, including the Museum of Fine Arts, Symphony Hall, Horticultural Hall, the Isabella Stewart Gardner Museum, the Harvard teaching hospitals, and many schools and colleges. Most are within walking distance of Northeastern University.

Major transportation facilities serving the Boston area are Logan International Airport, two rail terminals, bus terminals serving inter- and intrastate lines, and MBTA subway-bus service within the metropolitan-suburban area. There is a subway stop in front of the campus. For motorists, the best routes to the campus are the Massachusetts Turnpike (Exit 22) and Route 9, of which Huntington Avenue is the intown section.

The campus of 47 acres is divided by Huntington Avenue, with the main educational buildings on one side and dormitories on the other. The principal buildings, all of which have been constructed since 1938, are of glazed brick in contemporary classic style. Most are interconnected by underground passageways.

CARL S. ELL STUDENT CENTER

The Carl S. Ell Student Center provides facilities for student recreation and for extracurricular activities. The Alumni Auditorium, with a seating capacity of 1,300, is part of the Center. Also included are special drama facilities, a ballroom, main lounge, fine arts exhibition area, student offices, conference rooms, and a dining area seating more than 1,000.

THE UNIVERSITY LIBRARY

The Dodge Library is the main library on the Boston campus and maintains an open-stack system. Bound volumes in the library system exceed 190,000, and microfilm titles, 250,000. Collections are located in these areas:

1. The General Collection in the book stacks as indicated by the classification number given in the upper left corner of the catalog card.
2. The Reference Collection in the Cabot Reading Room to the left of the Circulation Desk, which includes bibliographies, government documents, maps, company publications, the information file, association publications, and theses.
3. The Periodical Collection on the basement level occupying the lower Reading Room and the first two back-stack levels.
4. The Reserve Book Collection adjacent to the Periodical Room on the basement level.
5. The Foreign Literature Collections in the Webster Reading Room to the right of the Circulation Desk.
6. The Audio-Facility Division consisting of sound recordings and magnetic tapes for instructional and individual use in the Richardson Room on the second floor. The Fine Arts and Education Collections are also located here.
7. The American and English Literature Collections in the new Literature Reading Room.
8. The Humanities Collection (Philosophy, Psychology, Religion) in Rooms 202 and 203.
9. The Microtext Collection housed on the basement level adjacent to the periodical room. This collection includes 300,000 titles in microprint, microfilm, and microfiche forms.
10. Directly behind the Circulation Area, the subject areas of Pure and Applied Science and the History Collection are located on the third- and fourth-stack levels.

The Card Catalog is a union list of materials in the University Library and is located in the Webster Reading Room.

The Circulation Department has an IBM card file of all students attending the University. To borrow materials, students should present university identification at the Circulation Desk. For extensive research, where it is not possible for the University Library to acquire materials, the inter-library loan system allows the acquisition of items from other collections throughout the country.

The University Library System includes two libraries in the Division of Research. Physics-Electrical Engineering is housed in 325 Dana Research Center and Chemistry-Mathematics is housed on the fifth floor of the United Realty Building.

Library Hours (Boston Campus)

Monday — Thursday	7:45 a.m. to 10:00 p.m.*
Friday	7:45 a.m. to 7:30 p.m.*
Saturday	8:30 a.m. to 4:00 p.m.
Sunday	1:00 p.m. to 10:00 p.m.*

The only days in the year that the Library is closed are Thanksgiving and Christmas.

Library Hours (Suburban Campus, Burlington)

Monday — Friday	8:30 a.m. to 9:00 p.m.
Saturday	8:30 a.m. to 1:00 p.m.

SUBURBAN CAMPUS

The Suburban Campus, located near the junction of Routes 128 and 3 in Burlington, Massachusetts, was established to meet the needs of individuals and of industry in the area.

In addition to graduate courses in engineering, physics, mathematics, business administration, science, education, and the arts, portions of undergraduate programs leading to the associate and bachelor's degrees, special programs for adults, and non-credit state-of-the-art programs are offered.

HENDERSON HOUSE

The University's conference center, Henderson House, is located in Weston, Massachusetts. The Center for Continuing Education conducts short-term courses, seminars, and special institutes for business, professional, and research groups. Henderson House is 12 miles from the main campus.

WARREN CENTER

The Warren Center for Physical Education and Recreation in Ashland, Massachusetts, serves as a year-round outdoor laboratory for students in Boston-Bouvé College. There are facilities for conferences, special education in arts and crafts, and sports, including aquatics. Buildings include a lodge, cottages, and an infirmary.

MARINE SCIENCE INSTITUTE

The Marine Science Institute at Nahant, Massachusetts, about 20 miles northeast of Boston, is a research and instructional facility primarily engaged in studies of marine biology and oceanography. The Institute is operated the year around.

*On these days the following reading rooms are open until 1 a.m., and during examination periods they are open 24 hours a day: Reference, Richardson, Literature, and Humanities.

GRADUATE SCHOOL



GRADUATE SCHOOLS AND DEGREE PROGRAMS

Graduate School of Actuarial Science

Master of Science in Actuarial Science

Graduate School of Arts and Sciences

Master of Arts Degrees

in the fields of

Economics, English, History, Political Science,
Psychology, and Sociology-Anthropology

Master of Science Degrees

in the fields of

Biology, Chemistry, Health Sciences,
Mathematics, and Physics

Doctor of Philosophy Degrees

in the fields of

Biology, Chemistry, Mathematics,
Physics, Psychology, and Sociology

Graduate School of Business Administration

Master of Business Administration

Graduate School of Education

Master of Education

Graduate School of Engineering

Master of Science Degrees

in the fields of

Chemical, Civil, Electrical, Industrial,
and Mechanical Engineering, and
Engineering Management

Doctor of Philosophy Degrees

in the fields of

Chemical, Electrical, and Mechanical Engineering

School of Law

Juris Doctor

Graduate School of Pharmaceutical Sciences

Master of Science in Hospital Pharmacy

Master of Science in Industrial Pharmacy

Master of Science in Medicinal Chemistry

Master of Science in Pharmacology

Graduate School of Professional Accounting

Master of Science in Accounting

General Graduate Division Regulations

REGISTRATION

Students must register in the Graduate Division Office at the times specified by the Graduate School calendar.

RESIDENCE

All work for advanced degrees must be completed in residence at the University unless approval has been obtained from the Dean of the Graduate Division for work taken elsewhere. Students who are in residence and are using the facilities of the University must register for such work.

PROGRAMS OF STUDY

At the time of his first registration, each full-time student must develop, with the assistance of his faculty adviser, a complete program of study for the degree for which he is registered. All subsequent changes must be approved by his faculty adviser.

Evening part-time students will be expected to complete the required courses outlined by each department, after which the elective courses may be undertaken. The study load for such students is limited to a program of two courses per quarter unless special permission to carry a heavier load is given by the director of the graduate school concerned.

GRADING SYSTEM

The performance of students in graduate courses will be recorded by the instructor by use of the following grades:

A. Excellent

This grade is given to those students whose performance in the course has been of very high graduate caliber.

B. Satisfactory

This grade is given to those students whose performance in the course has been at the level necessary for graduate credit.

C. Fair

This grade is used to indicate that the student's performance in the course may be acceptable but is not consistently at the level expected in graduate work.

F. Failure

This grade is used to indicate unsatisfactory work.

In addition, the following letter designations are used:

- I. Incomplete, without quality designation. This is used when a student does not take the final examination or otherwise fails to complete the work of the course.
- S. Satisfactory, without quality designation. This designation may be used for thesis and seminar work.
- W. Withdrawn without prejudice.

The designation "I" will be changed to a grade upon removal of the deficiencies which caused the grade of "I" to be reported. Such deficiencies must be removed within four weeks after the quarter ends, or the grade of "I" will be changed to a grade of "F." If the deficiencies are due to a missed final examination, permission to take a make-up must be obtained from the director of the respective graduate school within one week following the date of the missed examination, and the examination must be made up at the time specified by the Graduate Division.

WITHDRAWALS

In order to withdraw from a course, a student must fill out an official withdrawal form obtained at the Graduate Division Office or at the Burlington Campus Office. Withdrawals may be made through the ninth week of the quarter. Students will be withdrawn as of the date on which they fill out the form. Ceasing to attend a class or notifying the instructor does not constitute an official withdrawal.

Students who do not attend the first two class sessions and who do not notify the Graduate Division of their intention to withdraw will be dropped from the class for nonattendance.

Requests for withdrawal from a course after the ninth week of the quarter may be submitted to the Director of the appropriate Graduate School, and may be approved to avert unusual hardships on a student.

CLASS HOURS AND CREDITS

All credits are entered as quarter hours. A quarter hour of credit is equivalent to three fourths of a semester hour credit. All classes meet on a quarter basis. In the summer session, classes meet for six-week periods. The academic calendar for each graduate school should be consulted in order to determine the opening and closing dates of the sessions.

THE MASTER'S DEGREE

Admission

Specific requirements for each degree program will be found in the appropriate paragraphs for each graduate school or department.

Academic Classifications

Those students who have a bachelor's degree from an accredited program with acceptable quality of undergraduate work are classified as regular students.

Students whose records do not qualify them for enrollment as regular students may be accepted as provisional students. Provisional students must obtain a B average in the first 12 quarter hours of credit work in order to continue in the graduate program; at that time, they may be reclassified as regular students.

Those students who are not pursuing a specific degree program are classified as special students. Special students must satisfy the requirements for admission and perform work of satisfactory level in order to continue as special students.

Any student whose record is not satisfactory may be dropped by action of the graduate school committee for his program.

Academic Requirements

A candidate for the master's degree must satisfactorily complete an approved program conforming to the requirements of the department or graduate school in which he is registered.

The requirements for the master's degree are a minimum of 40 quarter hours of correlated work of graduate caliber, together with such other study as may be required by the department or graduate school concerned.

In order to qualify for any master's degree except that of Master of Science in Professional Accounting, an average grade of B must be obtained in the necessary quarter hour credits required for the degree, excluding any transfer credits. For the degree of Master of Science in Professional Accounting, an average grade of B must be obtained in 60 quarter hour credits and no less than a C for the remainder of the work. At the discretion of the graduate school committee for each of the various degrees, not more than 9 quarter hours of extra courses or repeated courses may be allowed in order to satisfy the grade requirements for a degree. At the discretion of the graduate school committee for each of the various degrees, the committee may limit the number of C grades allowable to satisfy the grade requirements for a degree.

Within the above limitations for extra or repeated courses, a required course for which a grade of F is received must be repeated with a grade of C or better, and may be repeated once. If a grade of F is received

in an elective course, that course may be repeated once to obtain a grade of C or better, or another elective course may be substituted for it. If a grade of C is received in a required course, that course may be repeated once to obtain a grade of B or better.

Comprehensive Examination

At the discretion of the department, a final written or oral comprehensive examination may be required. Such examinations will be given at least two weeks before the commencement at which the degree is expected.

Thesis

If a thesis is required in partial fulfillment of degree requirements, it must show independent work based in part upon original material, and must meet the approval of the respective graduate school committee.

Instructions concerning preparation of the thesis may be obtained from the respective graduate school committee.

Foreign Language Requirement

An examination to show evidence of ability in one or more foreign languages may be required in some graduate programs. This knowledge is established by an examination arranged by the respective graduate school committee.

Transfer Credits

A maximum of 12 quarter hours of graduate credit obtained at another institution may be accepted toward the master's degree provided the grades are A or B. Grades on transfer credits may not be used for the purpose of obtaining the academic average necessary for completion of the degree requirements.

Time Limitations

Course credits earned in the program of graduate study, or accepted by transfer, are valid for a maximum of seven years unless an extension is granted by the respective graduate school committee.

THE DOCTOR OF PHILOSOPHY DEGREE

The Doctor of Philosophy Degree is awarded to candidates who give evidence of high attainment and research ability in their major field. The degree requirements are administered by committees in charge of each degree program. These committees may be departmental graduate committees or committees of the respective graduate schools depending upon the nature of the program. It is the responsibility of the chairman of the committee to certify to the Graduate Division Office the completion of each requirement for each candidate.

Admission

Each degree program has an established admission procedure for students starting their doctoral work at Northeastern University.

Classification and Degree Candidacy

Students taking advanced graduate work are classified as follows:

1. **Doctoral Student**

Students in this classification have been admitted to a doctoral program.

2. **Doctoral Degree Candidate**

Students in this classification are doctoral students who have completed 40 quarter hours of acceptable graduate work beyond the bachelor's degree and have passed the qualifying examination.

3. **Special Students**

This classification is given to students taking advanced graduate work who are not enrolled for a master's degree, and who have not been admitted to a doctoral program.

Residence Requirement

Candidates for the Doctor of Philosophy Degree must spend the equivalent of at least one academic year in residence at the University taking graduate work. The committee of each degree program specifies the method by which the residence requirement is satisfied.

Qualifying Examination

Students must pass a qualifying examination within time limits set by the committee of the degree program. The material covered in the qualifying examination and the level of course work necessary to prepare for the examination are established by the committee for each program.

Comprehensive Examination

Degree programs may require a comprehensive examination during the time in which a student is a degree candidate. The purpose of this examination is to test the knowledge and skills of the student in a particular area and his knowledge of recent research developments in his field.

Course Requirements

The minimum course requirements of 40 quarter hours constitutes the work normally required for a master's degree. The course requirements beyond this are the doctoral course requirements and the amount of such work necessary in each doctoral program is specified by the committee in charge of the doctoral program.

Dissertation

Each doctoral student must complete a dissertation which embodies the results of extended research and makes an original contribution to the field. This work should give evidence of the candidate's ability to carry out independent investigation and interpret in a logical manner the results of the research. The method of approval of the dissertation is established by the committee in charge of the degree program. The original bound copy of the dissertation must be deposited in the library.

Foreign Language

The nature of the foreign language requirement and how this requirement is satisfied is established by the committee in charge of each degree program.

Final Oral Examination

The final oral examination will be taken after completion of all other requirements for the degree. This examination must be held at least two weeks before the commencement at which the degree is to be awarded.

The committee for the final oral examination for the doctoral degree is appointed by the committee in charge of the degree program, and the Dean of the Graduate Division is notified of the time of the examination.

The final oral examination will be on the subject matter of the doctoral dissertation and significant developments in the field of the dissertation. Other fields may be included if recommended by the examining committee.

Transfer Credit

If transfer credit for doctoral course work is desired, approval for such transfer credit must be given by the committee in charge of the degree program.

Time Limitation

After the establishment of degree candidacy, a maximum of five years will be allowed for the completion of the degree requirements. If a student wishes to obtain a time extension, he may, with the approval of the committee of his degree program, petition the Committee on Doctoral Degree Programs of the University Graduate Council for such extension.

Registration

All students must register in the Graduate Division Office for course work or dissertation as approved by their advisers or the departmental registration officer. After the first registration for doctoral work, registration must be continuous unless withdrawal is allowed by the committee in charge of the degree program. Students must be registered

for dissertation during the quarter in which they take the final oral examination.

INTERDISCIPLINARY PROGRAMS

Some graduate students may wish to pursue doctoral programs whose boundaries overlap substantially into two or more departments. In such cases, an interdisciplinary program may be established which corresponds in scope and depth to doctoral standards, but does not agree exactly with the individual departmental regulations. For such possibilities, the following plan is in operation:

Admission

Application for admission to interdisciplinary doctoral study consists of the submission of a carefully thought-out written proposal describing the areas of proposed study and research. The proposal may be a part of the initial application for admission to graduate study at Northeastern University, or it may be submitted by a student already enrolled. It may be directed to a doctoral degree-granting department or to the Dean of the Graduate Division, who directs it to the appropriate department. In either case, admission to interdisciplinary doctoral study requires favorable recommendation by the sponsoring doctoral degree-granting department and approval by authorized representatives of the graduate study committees of the departments appropriate to the disciplines covered by the applicant's proposal. The sponsoring department becomes the registration base of the student.

Formation of Interdisciplinary Committee

A student who has been accepted for interdisciplinary study must obtain the consent of an adviser who will direct his doctoral thesis. This adviser, who may or may not be a member of the registration department, will be chairman of the interdisciplinary committee for this student. A second member will be appointed from the registration department by its chairman. These two members will obtain one or more additional members or request the Dean of the Graduate Division to do so. At least two departments must be represented on the committee and a majority of the committee must come from doctoral degree-granting departments. The chairman of the registration department will notify the Dean of the Graduate Division of the membership of the committee as soon as arrangements are complete.

Duties of Interdisciplinary Committee

A member of the interdisciplinary committee who is also a member of the registration department will serve as the registration officer to approve the course registration for the student. A copy of the approved course registration must also be filed with the other committee members and with the graduate study committee of the registration department.

The interdisciplinary committee will be responsible for the administration of the qualifying examination, language examination, approval of the thesis, and comprehensive examination. This committee must also certify to the registration department the completion of the requirements for the award of the doctoral degree.

The interdisciplinary committee must assure that the program of the student represents standards comparable to those of the registration department and that the program is not so broad that it has inadequate depth in any area.

The program of the student may be reviewed at any time by the Dean of the Graduate Division to determine whether objectives of the program are being met.

- Simon L. Cohen
B.S., M.S.W., Boston University
Lecturer in Education
- David R. Cook
Chairman, Department of Counselor Education
B.S.Ed., Boston University; M.S., Ed.D., Indiana University
Professor of Education
- Ray C. Dethy
B.Sc., M.A., Ph.D., Ohio State University
Associate Dean of Education
- E. Lawrence Durham
A.B., M.A., Boston University
Professor of Education
- Lionel P. Etscovitz
A.B., Brown University; Ed.M., Boston University
Assistant Professor of Education
- Robert J. Ferullo
Associate Professor of Special Education and
Director of Speech and Hearing Center
B.S.B.A., Ed.M., Ed.D., Boston University
- Iris E. Fodor
B.A., City College of New York; M.A., Ph.D., Boston University
Assistant Professor in Education
- J. E. Gilbert
Associate Professor of Programmed Instruction
Technology and Director of Office of Educational Resources
B.S., University of New Mexico; M.A., American University
- George J. Goldin
B.S., University of Massachusetts; M.S., Boston University; Ph.D., Brandeis University
Director of Rehabilitation Institute
- E. Vaughn Gulo
A.B., Ed.D., Boston University; M.A., University of Texas
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- Charles F. Haley
Associate Director, Graduate School of Education and
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- Frances A. Harding
A.B., Harvard University
Lecturer in Education
- Ruth Harmon
LL.B., M.Ed., Boston University
Assistant Professor of Education
- Robert W. Hayes
B.A., Bates College; M.Ed., Ed.D., Boston University
Lecturer in Education
- Melvin Howards
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B.S., Drake University; M.A., Ph.D., New York University
- Maurice Kaufman
B.S., M.S., City College of New York; Ph.D., New York University
Assistant Professor of Education
- Helen J. Kenney
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Associate Professor of Education
- Alvin Kent
B.A., New School for Social Research
Lecturer in Education

- Robert S. Lang Associate Professor of Graphic Science
B.S., Northeastern University; Ed.M., Boston University
- Mary J. Lee Associate Professor of Education
B.A., Boston University; M.Ed., Northeastern University
- Donald S. Leeds Assistant Professor of Education
B.A., M.A., New York University
- Carlton B. Lehmkuhl Assistant Professor of Education and
Director of Institutional Research
B.S., M.S., Indiana University; Ph.D., University of Minnesota
- Martin A. Linsky Lecturer in Education
B.A., Williams College; LL.B., Harvard Law School
- Reuben J. Margolin Professor and Chairman,
Department of Rehabilitation and Special Education
A.B., Northeastern University; M.A., Boston University; Ed.D., Columbia
University
- Frank E. Marsh Dean of the College of Education
A.B., Clark University; Ed.M., University of New Hampshire; Ed.D., Boston
University
- Robert C. McLean Associate Professor of Education
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vard University
- Gilbert Neil Instructor in Education
A.B., Gordon College; M.A., Emerson College
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- Robert W. Read Assistant Professor of Education
A.B., Boston University; M.A., Stanford University
- George B. Rochfort, Jr. Associate Professor of Education and
Acting Chairman of Department of Instruction
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- Nancy E. Rosoff
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Instructor in Education
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- Dorothy M. Singer
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- Alan B. Sostek
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Associate Professor of Education
- Herbert Sonthoff
B.A., University of Georgia; M.A., Harvard University
Assistant Professor of Education
- Joseph Spear
A.B., Harvard University; M.A., Boston University
Lecturer in Education
- Paul H. Tedesco
A.B., Harvard University; A.M., Boston University
Assistant Professor of Education
- Lucy T. Ulman
B.S., M.Ed., Boston University
Lecturer in Education
- Michael E. Werle
B.S.Ed., Ohio University; M.Ed., Northeastern University
Assistant Professor of Education
- Albert C. Williamson
A.B., A.M., Boston College; Ed.M., State College at Bridgewater
Lecturer in Education
- Wesley G. Woll
B.S., Springfield College; M.D., Boston University
Lecturer in Education
- Alvin D. Zalinger
B.S., M.A., Boston University
Associate Professor of Education
- William Zimmerman
B.S., University of New Hampshire; M.Ed., Ed.D., University of Miami
Associate Professor of Education and
Chairman of Department of Educational Administration

Programs of the Graduate School of Education

MASTER OF EDUCATION

Professional Specializations

Counseling
 Elementary School
 Secondary School
 College and Community
Educational Administration
Educational Research Technology
Elementary Mathematics
Elementary Science
Liberal Arts Emphasis
Reading
Special Education
 Teaching the Deaf
 Teaching the Emotionally Disturbed
 Teaching the Mentally Retarded
Speech Pathology and Audiology
Secondary Mathematics
Vocational Rehabilitation Administration

Teacher Preparation Programs

Elementary Education
Secondary Education
 English
 Mathematics
 Modern Languages
 Science
 Social Studies

CERTIFICATE OF ADVANCED GRADUATE STUDY (CAGS)

Counseling
Educational Administration

MASTER OF EDUCATION DEGREE

Admission to Degree Candidacy

An applicant must have earned a bachelor's degree from an accredited institution and must complete all admissions procedures as described.

Full-Time Study

Filing Deadlines

- April 1 for Summer Quarter
- April 1 for Fall Quarter
- November 1 for Spring Quarter

No applications are accepted for the Winter Quarter.

Materials

On or before the deadlines cited above, the Director of the Graduate School of Education will accept the following:

1. A completed application
2. Official transcripts of previous collegiate study
3. References as described:
 - a. if no teaching experience, three general references
 - b. if teaching experience, one reference from the current or most recent supervisor
4. Score obtained on the Miller Analogies Test
5. Record of an interview with the Director of the Graduate School of Education or his designate

A full-time student must take a minimum of 3 courses in all but the Summer Quarter. Enrollment in an additional course must be approved by the adviser.

Part-Time Study

The materials required to support part-time degree candidacy are the same as noted above for the full-time candidate. It is recommended that **all** materials be on file in the office of the Graduate School at the time of the initial interview. In no case, however, will an interview and course registration be permitted without a minimum of a completed application and a copy of the undergraduate transcript.

The additional materials — the Miller Analogies Test score and the reference(s) — must be received not later than the end of the sixth week of the first quarter of registration, or subsequent quarter registration will not be permitted.

A part-time student may enroll in a maximum of two courses in any given quarter.

Special-Student Status

The Director of the Graduate School of Education or his designate may admit to graduate study any person who presents evidence of a bachelor's degree and who appears otherwise prepared to undertake study in the Graduate School of Education, providing that the applicant

1. Files an application at the time of his interview
2. Completes an interview with the Director or his designate
3. Acknowledges that academic credit earned in such study may not be used to fulfill degree requirements in the Graduate School of Education.

A special student may enroll in a maximum of two courses in any given quarter.

Academic Classifications

1. *Regular* When materials to support degree candidacy meet the criteria for immediate matriculation.
2. *Provisional* When materials to support degree candidacy fail to meet a given criterion, the candidate may be classified as a provisional student. Provisional students must obtain a B average in the first four degree credit courses in order to continue in the graduate program. At that time, they may be reclassified as regular students.
3. *Special* See above.

Programs of Study

The curricula of the programs for the Master of Education degree are given on pages 47-59.

Programs are available for students with or without regular teaching certification. Those with certification may major in the professional specializations listed on page 46.

Students without certification must pursue either a Master of Education degree program for which certification is not mandatory (as indicated on page 46), or a degree program which includes supervised student teaching. At Northeastern University, state certification and professional requirements are satisfied only as part of teacher preparation degree programs (as described on pages 58-59) at the elementary level and in the following subject areas at the secondary level: English, Mathematics, Modern Languages, Science, and Social Studies.

Program Selection

Upon acceptance as a degree candidate, the student will be assigned to an adviser in his major area of study. The student's initial program and any subsequent changes may develop only as a result of the written recommendation of the adviser.

Comprehensive Examination

The requirement for a comprehensive examination will be indicated to the student by the adviser.

Academic Requirements

In order to qualify for the Master's Degree in Education, an average grade of B must be obtained in the degree credit courses. No additional course credits may be allowed in order to satisfy the B average required for the degree.

Effective with the posting of the grades for the Winter Quarter, 1967-68 academic year, no student who receives a grade of less than B in three or more degree credit courses will be permitted to continue in the program.

Credit and Course Requirements

In satisfying the requirement for a minimum of 40 quarter hours a student's program must include at least 12 courses which apply to the degree.

Transfer Credits

See General Graduate Division Regulations, page 31.

**CERTIFICATE OF ADVANCED GRADUATE STUDY
(CAGS) PROGRAM**

The candidate must present evidence of a master's degree from an accredited institution. Additional information about admission requirements may be obtained from the office of the Graduate School of Education.

Financial Information

Tuition Charges

Tuition for master's degree candidates, CAGS candidates, and special students is \$30 per quarter hour of credit.

Tuition Payments

Tuition statements are mailed to students by the Bursar's Office and are payable on or before the date specified. Checks should be drawn payable to "Northeastern University."

Registration Fee

All students new to Northeastern University are charged a registration fee of \$10 at the time of their first billing.

Late Payment Fee

A late payment fee of \$5 is charged all students for failure to pay tuition on the due date unless special arrangements have been approved by the Student Accounts office.

Make-up Examination Fee

All students given permission to take a make-up of a final examination are charged a fee of \$5.

Student Center Fee

All students on the Huntington Avenue Campus are charged a fee for the services available in the Student Center as follows:

Part-time students	\$.75 each quarter
Full-time students (including cooperative students)	\$12.50 each quarter
Teaching Assistants and Research Fellows	\$6.25 each quarter

Commencement Fee

A fee of \$25 covering commencement is required by the University of all candidates for a degree. This fee is payable on or before May 1 of the year in which the student expects to graduate.

Health Services Fee

All full-time students, including those on the Cooperative Plan and teaching and tuition assistants, will pay a nonrefundable University Health Services fee of \$25 per year. This fee will cover the group Blue Cross-Blue Shield program and the medical services which are provided to students by the University Health Service.

Infirmiry Fee

All students are assessed an Infirmiry Fee of \$10 per quarter.

Refunds

Tuition refunds will be granted only on the basis of the date appearing on the official withdrawal form filed by the student. Nonattendance does not constitute official withdrawal. Questions regarding refunds should be discussed with the Bursar's Office.

Refunds will be granted in accordance with the following schedule:

Amount of Refund:	
Official Withdrawal Filed Within:	Percentage of Tuition
First week of Quarter	100%
Second week of Quarter	75%
Third week of Quarter	50%
Fourth week of Quarter	25%

Financial Aid

Students who wish information regarding sources of financial aid and regarding limited numbers of graduate or teaching assistantships should communicate with the office of the Graduate School of Education after March 15.

Fields of Study

PROGRAMS IN PROFESSIONAL SPECIALIZATIONS

Master of Education

Applicants who possess a valid teaching certificate or who are eligible for such certificate at the time the program is begun, may be admitted to the study for the Master of Education degree and specialize in one of the following areas:

	Page
Counseling	
Elementary School	48
Secondary School	48
*College and Community	49
Educational Administration	49
*Educational Research Technology	50
Elementary Mathematics	51
Elementary Science	51
Liberal Arts Emphasis	51
Reading	52
Secondary Mathematics	52
Special Education	
Teaching the Deaf	54
Teaching the Emotionally Disturbed	55
Teaching the Mentally Retarded	56
Speech Pathology and Audiology	52-54
*Vocational Rehabilitation Administration	56-57

All students must complete one of the programs as outlined in the following pages. In most cases, the sequence is designed to be very flexible. Any variations or changes must have the prior recommendation of the major adviser and approval of the Director of the Graduate School of Education.

*Teaching certification not mandatory.

MASTER OF EDUCATION CORE REQUIREMENT

Required of all candidates:

Area I — Research

50.815 Research Design in Education

(Entrance into this course must be preceded by a graduate or undergraduate course in statistics.)

All candidates must complete at least one course in each of two of the following areas:

Area II — Psychological and Cognitive Processes

50.806 Psychology of Learning and Thinking

50.808 Seminar in Child Development

50.809 Seminar in Adolescent Development

50.810 Psychology of Personality

50.811 Psychology of Cognition

Entrance into any of these courses must be preceded by a graduate or undergraduate course in psychology.

Students having an undergraduate major in psychology may petition to have the requirement of taking a course in this area waived.

Area III — Social Foundations

50.802 Sociology of Education

50.805 Personality and Social Structure

Entrance into either of these courses must be preceded by a graduate or undergraduate course in sociology.

Students having an undergraduate major in sociology may petition to have the requirements of taking a course in this area waived.

Area IV — Humanistic Foundations

50.812 History of Education

50.813 Philosophy of Education

50.818 Comparative Education

Students may enroll directly into any of these courses.

Students who have taken a comparable graduate course may petition to have the requirements of taking a course in this area waived.

PROGRAMS

Counseling

Elementary School Counseling

Master of Education Core (required of all candidates)

Three courses as defined on page 47.

Guidance Core (required of all Elementary Counseling majors)

- 53.800 Foundations of Guidance
- 53.801 Tests and Test Procedures
- 53.802 Vocational Development and Occupational Information
- 53.803 Counseling I
- 53.805 Counseling Practicum (Elementary Level)
- 53.810 Counseling in the Elementary School
- 53.823 Measurement of Intelligence: Stanford-Binet Scales

Electives

To be admitted to 53.805, Counseling Practicum, the student must make application on a form provided by the Department of Counselor Education and receive the permission of the practicum supervisor to register for the practicum. A grade of B or better in 53.803, Counseling I, and 53.810, Counseling in the Elementary School, is required for admission to the practicum.

Secondary School Counseling

Master of Education Core (required of all candidates)

Three courses as defined on page 47.

Guidance Core (required of all Secondary Counseling majors)

- 53.800 Foundations of Guidance
- 53.801 Tests and Test Procedures
- 53.802 Vocational Development and Occupational Information
- 53.803 Counseling I
- 53.804 Counseling II
- 53.805 Counseling Practicum
- 53.806 Field Work in Guidance

Electives

To be admitted to 53.805, Counseling Practicum, the student must make application on a form provided by the Department of Counselor Education and receive the permission of the practicum supervisor to register for the practicum. A grade of B or better in 53.803, Counseling I, and 53.804, Counseling II, is required for admission to the practicum.

College and Community Counseling

This program is designed for those students who plan to work at the college or junior college level, or for those students who will counsel in non-educational institutions such as the state employment service, Neighborhood Youth Corps, Youth Opportunity Centers, YMCA, and YWCA. College and junior college positions that a student might enter from this program include residence hall counselor, director of residence halls, director of student activities, and assistant dean of men or women. For some students in this program, 53.809 will not be required and may be waived by the adviser and an elective substituted. Teacher certification is **not** a prerequisite for this program.

Master of Education Core (required of all candidates)

Three courses as defined on page 47.

Guidance Core (required of all College and Community Counseling majors)

- 53.800 Foundations of Guidance
- 53.801 Tests and Test Procedures
- 53.802 Vocational Development and Occupational Information
- 53.803 Counseling I
- 53.804 Counseling II
- 53.809 Student Personnel Work in Higher Education
- 53.805 Counseling Practicum (college level)
- Electives

To be admitted to 53.805, Counseling Practicum, the student must make application on a form provided by the Department of Counselor Education and receive the permission of the practicum supervisor to register for the practicum. A grade of B or better in 53.803, Counseling I, and 53.804, Counseling II, is required for admission to the practicum.

Educational Administration

Master of Education Core (required of all candidates)

Three courses as defined on page 47.

Educational Administration Core Courses (required)

- 52.810 Leadership in Education: Part I
- 52.811 Leadership in Education: Part II
- Departmental Program of Study
- 52.812 Educational Administration: An Overview of Administrative Tasks
- 52.813 Instructional Leadership: Curriculum Development and Supervision
- 52.805 Problems in School Administration: A Simulated Experience
- 52.806 Directed Field Experiences in School Administration I
- 52.807 Directed Field Experiences in School Administration II
- 52.808 Seminar in Educational Administration
- Elective

Educational Research Technology (for full-time students only)

The general objective of the program is to train technicians who will have: (1) an understanding of the nature and characteristics of research as it is carried on in educational research agencies; (2) a basic knowledge of research methodology and related theory that will enable them to assist at all stages of educational research; and (3) the technical skill to carry out independently the operational aspects of educational research.

The specific objectives stated above and the related competencies will be developed through an integrated program of didactic study and related internship experiences. The internships will be unpaid. The total program will require five academic quarters to complete. (A quarter of didactic study usually consists of 11 weeks of study, one week of examinations, and one week of vacation; an internship quarter consists of 12 weeks of work and one week of vacation.)

Trainees will be admitted in June of the academic year and successful candidates will complete their training in September of the following year (one academic year plus two summers). Stipends and tuition allowances are available.

The overall training program is designed to permit all students to proceed through it as a group. All candidates will be required to complete the following courses:

Master of Education Core (required of all candidates)

Three courses as defined on page 47.

Educational Research Core (required of all Educational Research majors)

- 51.803 Analysis of the Teaching — Learning Process
- 50.841 Introduction to Educational Statistics
- 50.842 Intermediate Educational Statistics
- 50.814 The Nature and Theory of Psychological and Educational Measurement
- 50.847 Elements of Machine Data Processing
- 50.840 Introduction to Educational Research
- 50.843 Research Methods I
- 50.844 Research Methods II
- 50.845 Research Internship and Field Seminar I
- 50.846 Research Internship and Field Seminar II

Elementary Mathematics

Master of Education Core (required of all candidates)

Three courses as defined on page 47.

Mathematics Core (required of all Mathematics majors)

- 51.810 Elementary Mathematics, Content and Methods
- 51.811 Elementary Number Concepts for Teachers
- 51.812 Elementary Algebraic Concepts for Teachers
- 51.813 Elementary Geometric Concepts for Teachers
- 51.815 Seminar in Mathematics and Science in the Elementary School

or

- 51.825 Seminar in Mathematics Education
- Electives, which may be taken only with the prior consent of the adviser

Elementary Science

Master of Education Core (required of all candidates)

Three courses as defined on page 47.

Science Core (required of all Elementary Science majors)

- 51.830 Concepts of Earth Sciences for Elementary Teachers
- 51.831 Concepts of Biology for Elementary Teachers
- 51.832 Concepts of Physical Sciences for Elementary Teachers
- 51.833 Teaching of Elementary School Sciences
- 51.815 Seminar in Elementary Science and Mathematics

Electives

Liberal Arts Emphasis

Master of Education Core (required of all candidates)

Three courses as defined on page 47.

Liberal Arts Core (required of all Liberal Arts majors)

Nine Electives. All electives must be chosen from the offering of Arts and Sciences, Business Administration, or Engineering unless otherwise approved by the student's adviser. The student should confer with the Director in planning these courses.

Reading

Master of Education Core (required of all candidates)

Three courses as defined on page 47.

Reading Core (required of all Reading majors)

- 54.801 Teaching Reading and Language Skills, Elementary Level
 - 54.802 Introduction to Reading Disability: Elementary and Secondary Levels
 - 54.804 Diagnosis and Correction of Reading Disability I
 - 54.805 Diagnosis and Correction of Reading Disability II
 - 54.806 Practicum in Reading
 - 54.808 Teaching Reading and Language Skills, Secondary Level
- Electives

Secondary Mathematics

Master of Education Core (required of all candidates)

Three courses as defined on page 47.

Secondary Mathematics Core (required of all Secondary Mathematics majors)

- 51.823 Modern High School Mathematics, Content and Methods
- 51.825 Seminar in Mathematics Education
- 51.829 General Mathematics, Content and Methods

Six electives which must be taken only with the prior consent of the adviser.

Students with little or no background in mathematics education will be required to demonstrate their knowledge of certain areas of mathematics as determined by the adviser. This may be done by examination or in other ways, including the successful completion of courses offered at the Center for Programmed Study without degree credit.

Speech Pathology and Audiology

The program leading to the degree of Master of Education in either Speech Pathology or Audiology is designed to qualify candidates for membership in and certification by the American Speech and Hearing Association. Graduates of the program are also qualified for further graduate study, and for employment as speech pathologists or audiologists in clinics, hospitals, public schools, and rehabilitation centers.

This program assumes that students have completed an undergraduate program in speech and hearing. Those without such preparation will be required to complete additional courses beyond the 48 quarter hours normally required for the master's degree. Certification as a teacher of regular classes is also a prerequisite.

This program is conducted in affiliation with the Massachusetts Eye and Ear Infirmary.

Speech Pathology

Master of Education Core (required of all candidates)

Three courses as defined on page 47.

Speech Pathology Core (required of all Speech majors)

- 50.906 Seminar: Language Disturbances in Children
- 50.912 Differential Diagnosis in Speech Pathology
- 50.913 Clinical Externship (no degree credit)
- 50.914 Clinical Audiometry I
- 50.916 Test Procedures in Speech and Language Pathology
- 50.991 Thesis (optional) Two electives may be substituted.

Electives (may be in Speech Pathology or some related area such as Counseling, Guidance, Psychology, Reading, Rehabilitation, or Special Education; see also list of electives, p. 54.)

Audiology

Master of Education Core (required of all candidates)

Three courses as defined on page 47.

Audiology Core (required of all Audiology majors)

- 50.915 Clinical Audiology II
- 50.914 Clinical Audiometry I
- 50.919 Clinical Audiometry II
- 50.917 Advanced Anatomy, Neurology and Physiology of Speech and Hearing (Massachusetts Eye and Ear Infirmary)
- 50.918 Pathologies of the Ear (Massachusetts Eye and Ear Infirmary)
- 50.921 Seminar: Audiology (Massachusetts Eye and Ear Infirmary)
- 50.913 Clinical Externship (Massachusetts Eye and Ear Infirmary)
No degree credit.
- 50.991 Thesis (optional) Two electives may be substituted.

Electives (may be in Speech Pathology or some related area such as Counseling, Guidance, Psychology, Reading, Rehabilitation, or Special Education; see also list of electives, p. 54.)

(Continued)

Electives in Speech Pathology and Audiology

- 50.918 Pathologies of the Ear
- 50.902 Organization and Management of Public School Speech and Hearing Therapy Programs
- 50.911 Seminar: Stuttering
- 50.903 Seminar: Cerebral Palsy
- 50.904 Seminar: Aphasia and Related Neurological Disturbances
- 50.905 Seminar: Functional and Organic Disorders of Voice
- 50.906 Seminar: Language Disturbances in Children
- 50.922 Seminar: Functional and Organic Disorders of Speech
- 50.917 Advanced Anatomy, Neurology, and Physiology of Speech and Hearing
- 50.921 Seminar: Audiology
- 50.920 Physiological Acoustics
- 50.923 Social Aspects of Communication Disorders
- 50.924 Seminar: Speech Pathology

The following courses will be taught at the Massachusetts Eye and Ear Infirmary by the medical and/or audiology staff.

- Fall: Advanced Anatomy, Neurology, and Physiology of Speech and Hearing
- Winter: Pathologies of the Ear
- Spring: Seminar: Audiology
Clinical Externship — Audiology

Special Education***Teaching the Deaf***

The following curriculum in the preparation of teachers of the deaf is offered in affiliation with the Beverly School for the Deaf. The program is designed for those candidates who are certified teachers. Candidates lacking prerequisite courses will be required to complete them prior to the following program.

Master of Education Core (required of all candidates)

Three courses as defined on page 47.

Teaching the Deaf Core (required of all Teaching the Deaf majors)

- 50.901 Psychology of Exceptional Children
- 50.914 Clinical Audiometry I
- 50.915 Clinical Audiology II
- 50.916 Test Procedures in Speech and Language Pathology
- 50.925 Teaching Speech to the Deaf
- 50.926 Teaching Language and Reading to the Deaf
- 50.927 Methods and Materials in Deaf Education
- 50.928 Speechreading and Auditory Training
- 51.808 Student Teaching of the Deaf (8 quarter hours)

Teaching the Emotionally Disturbed

This program is designed for certified teachers of regular classes who wish to specialize in teaching emotionally disturbed children and youth. Degree candidates may be required to take 50.803, Child Psychology, without degree credit if they have not previously taken a similar course.

Master of Education Core (required of all candidates)

Three courses as defined on page 47.

Courses required for teachers of the emotionally disturbed:

- 50.805 Personality and Social Structure
- 50.807 Abnormal Psychology
- 50.930 Etiology, Dynamics and Treatment of Emotional Disturbance in Children
- *50.931 Teaching the Emotionally Disturbed: Problems and Strategies
- 51.806 Practicum and Seminars I, II, III, IV
- 53.801 Tests and Test Procedures
- Electives (Students may also choose electives from selected courses from Remedial Reading and Speech Pathology and Audiology programs.):
- 50.901 Psychology of Exceptional Children
- 50.932 Group Dynamics
- 50.933 Mental Health
- 50.935 Socio- and Psychodynamics of Family Life
- 50.999 Directed Study in Special Education

*Prerequisites: Etiology, Dynamics, and Treatment of Emotional Disturbance in Children and the permission of the Director of the Division for the Education of the Emotionally Disturbed.

Teaching the Mentally Retarded

This program is designed for individuals who hold certificates for teaching in the regular classroom and wish to qualify as special class teachers in the area of the mentally retarded.

Master of Education Core

Three courses as defined on page 45.

Teaching the Mentally Retarded Core (required of all candidates)

- 50.901 Psychology of Exceptional Children
- 50.940 Psychology of the Mentally Retarded
- 50.941 Methods and Materials — Trainable Retarded
- 50.942 Methods and Materials — Educable Retarded
- 50.943 Industrial Arts and Crafts
- 50.944 Measurement and Evaluation in Special Education
- 51.807 Practicum in Special Education
- * — Statistics — Descriptive (prerequisite — may be taken through Center for Programmed Instruction)

Electives:

- 50.999 Directed Study — Rehabilitation and Special Education
- 53.802 Vocational Development and Occupational Information
- 50.903 Seminar: Cerebral Palsy
- 50.904 Seminar: Aphasia and Related Neurological Disturbances
- 50.807 Abnormal Psychology
- 54.802 Introduction to Remedial Reading: Elementary and Secondary Levels
- 54.804 Diagnosis and Correction of Reading Disability I
- 54.805 Diagnosis and Correction of Reading Disability II
- 50.945 Rehabilitation for Special Education Teachers

Vocational Rehabilitation Administration

Students majoring in Vocational Rehabilitation Administration should anticipate taking 14 credit courses for the degree under either of the following options:

Plan A

For students with considerable rehabilitation or administration experience, the program takes one calendar year from September through August and includes four academic quarters. During this time the student also completes his field work.

Plan B

For students with limited rehabilitation or administration experience, the program includes four academic quarters plus three full quarters spent in field work assignments. These quarters are arranged either to

*Required, but does not carry degree credit.

alternate with academic quarters or to be combined in any sequence from three to ten months. The degree program in this plan runs from September to June (21 months).

Candidates are eligible for stipends under either of the two plans for the duration of the plan.

Master of Education Core (required of all candidates)

Three courses as defined on page 47.

Rehabilitation Core (required of all Vocational Rehabilitation Administration majors)

- 50.950 Introduction to Rehabilitation
- 50.951 Principles of Medical Rehabilitation and Social Services
- 50.952 Vocational Rehabilitation
- 50.954 Organization and Administrative Theory
- 50.953 Essentials of Supervision in Rehabilitation
- 50.955 Administration of a Rehabilitation Setting
- 50.957 Federal-State Relations in Rehabilitation
- *50.959 Practicum in Rehabilitation Research
- *50.960 Practicum in Rehabilitation Administration
- *50.816 Statistics

Electives. Students will be required by their advisers to choose electives from the following courses as they pertain to specific administrative goals.

- 50.932 Group Dynamics
- 50.956 Community Planning in Rehabilitation
- 50.958 Social Welfare and Rehabilitation
- 50.962 Administration of a Sheltered Workshop
- 50.964 Rehabilitation and the Law
- 50.965 Occupational Placement
- 41.800 Accounting for Managerial Control
(offered by Graduate School of Business Administration)

*Required, but does not carry degree credit.

TEACHER PREPARATION

Master of Education

Program of Studies

Applicants who do not possess a valid teaching certificate are offered a program designed to prepare them for state certification and concurrently fulfill the requirements for a Master of Education degree. Initial preparation programs are available for elementary and secondary teaching fields. No student will be permitted to do student teaching except as a part of the appropriate teacher preparation program for the Master of Education degree.

If preparation courses in general psychology, principles of teaching, child psychology or adolescent psychology have not been taken previously, applicants will be required to take such work in addition to degree requirements. Such courses carry graduate credit but may not be included in a degree program. The Director of the Graduate School in Education will determine when these requirements have been satisfied.

Student Teaching

Applications for student teaching must be received by the Director of the Graduate School of Education no later than October 15. Student teaching in the graduate program is scheduled for the Spring quarter.

Acceptance in the student teaching program is contingent upon:

- An academic average of B or better in all courses pursued in the Graduate School of Education.
- The recommendation of the student's major adviser.

Ordinarily, student teaching will not be permitted until the following courses have been completed: 50.806, Psychology of Learning and Thinking; 51.801, Curriculum of the American School; 51.802, Evaluation and Measurement; the special method(s) course(s) and any preparation courses that are necessary.

Because of the unique demands of student teaching, participants may not enroll for additional courses concurrent with student teaching without the recommendation of the major adviser and the approval of the Director.

Elementary Education

Preparation Courses (if not taken previously): General Psychology, Principles of Teaching, and Child Psychology.

Master of Education Core (required of all candidates)

Three courses as defined on page 47.

Elementary Education Core (required of all Elementary Education majors)

54.801 Teaching Reading and Language Skills (special methods)

51.810 Elementary Arithmetic Concepts for Teachers (special methods)

51.834 Elementary Science Methods and Curriculum (special methods)

——— One other special methods course, which may be the second course in any of the above sequences.

51.805 Student Teaching and Seminar — 8 Quarter Hours

51.801 Curriculum of American School

51.802 Measurement and Evaluation

Secondary Education

Preparation Courses: General Psychology (if not taken previously), Principles of Teaching, and Adolescent Psychology.

Master of Education Core (required of all candidates)

Three courses as defined on page 47.

Secondary Education Core (required of all Secondary Education majors)

——— Special Methods in the major subject area — one course (two courses for science)

51.805 Student Teaching and Seminar — 8 Quarter Hours

51.801 Curriculum of the American School

51.802 Measurement and Evaluation

Electives

CERTIFICATE OF ADVANCED GRADUATE STUDY

The Certificate of Advanced Graduate Study is available to applicants who have demonstrated a strong background in the special field of study at the master's level and who meet the specific requirements of the Graduate School of Education and the appropriate department.

Counseling
Educational Administration

All students must complete one of the programs as outlined in the following pages. In most cases, the sequence is designed to be very flexible. Any variations or changes must have the prior recommendation of the major adviser and approval of the Director of the Graduate School of Education.

Programs

Counseling

A minimum of 40 quarter hours beyond the master's degree is required for completion of the program.

Core Courses (required)

- 50.819 Theories of Developmental Psychology
- 50.813 Philosophy of Education
- 50.805 Personality and Social Structure
- or
- 50.810 Psychology of Personality
- 53.808 Group Counseling
- 53.830 Advanced Seminar and Field Work

Electives:

- 53.831 Advanced Group Counseling
- 53.832 Play Therapy
- 53.833 Seminar in Counseling Supervision and In-Service Education

Additional electives will be selected with the approval of the adviser, with the stipulation that at least 6 quarter hours toward the CAGS be taken in courses outside of the Graduate School of Education.

Educational Administration

A minimum of 12 courses beyond the master's degree is required for completion of the program.

Core Courses (required)

- 52.830 Current Issues in Educational Administration
- 52.831 Innovation and Change in American Public Schools
- 52.832 The Process of Administration

Electives:

- 52.833 Research and Statistical Methods for School Administrators
- 52.834 Educational Finance
- 52.835 School Business Management
- 52.836 Personnel Administration
- 52.837 School-Community Relations
- 52.838 School Plant Planning
- 52.839 Operation and Maintenance of the School Plant
- 52.840 Problems in School Administration: A Simulated Experience — The Superintendency
- 52.841 Problems in School Administration: A Simulated Experience — Assistant Superintendent for Business Management
- 52.842 Problems in School Administration: A Simulated Experience — Assistant Superintendent for Instructional Services
- 52.899 Directed Study
- 52.843 Administrative Internship
- 52.844 School Law

NOTE: In addition, the adviser may prescribe courses outside the Department of Educational Administration.

DESCRIPTION OF COURSES

All courses carry four quarter hours' credit unless indicated otherwise. Please see the current brochure for summer, fall, winter, and spring quarter listings.

Prerequisite Courses

Several programs require satisfactory completion of prerequisite courses. These courses include:

Descriptive Statistics	}	No charge, no credit courses offered by the Center of Programmed Study.	
Inferential Statistics			
General Psychology			
50.803	Child Psychology	}	See course descriptions.
50.804	Adolescent Psychology		
50.816	Statistics		
51.800	Principles of Teaching		

FOUNDATIONS OF EDUCATION

50.801 Social Foundations of Education

(Students with heavy undergraduate concentration in anthropology-sociology may petition to have this course waived.)

Introduction to the behavioral sciences. Major concepts, propositions, and theoretical orientations in cultural anthropology, sociology, and social psychology.

50.802 Sociology of Education

Prep. 50.801,

Social Foundations of Education

The functioning of educational institutions in their social and cultural milieu will be examined from anthropological and sociological perspectives. The school as a social system; influence of the stratification system, youth cultures, and racial antagonisms upon the educational enterprise.

50.803 Child Psychology

Prep. General Psychology

A review of the principles of child development from birth to pre-adolescence. Particular emphasis will be placed on intellectual, social, and emotional development. The theoretical formulations of psychoanalysis, social learning theory, and Piaget will be discussed in the context of relevant research in these areas, as well as their educational implications.

For Teacher Preparation degree candidates only.

50.804 Adolescent Psychology

Prep. General Psychology

Social, emotional, and intellectual development through the adolescent years. Problems in family relationships and in the adolescent's social environment as well as his adjustment in school. Case history material.

For Teacher Preparation degree candidates only.

50.805 Personality and Social Structure

Prep. Permission of Instructor

Human behavior from a combined psychodynamic and sociological point of view, with special emphasis on socialization and the relations between the

individual and the collectivity. The integration of relevant theories from psychology, sociology, and anthropology.

50.806 Psychology of Learning and Thinking

The basic principles and conditions of acquisition, retention, and transfer of learning.

50.807 Abnormal Psychology

How personality becomes disordered. Problems of neurosis, character disorders, psychosomatic disorders, and psychoses. Current methods of clinical diagnosis and treatment will be reviewed.

50.808 Seminar in Child Development

A seminar course with emphasis on discussion of child development theories with special reference to personality and cognitive development. Critical evaluation of research related to child development theories with particular emphasis on recent trends, new approaches, and relevance to educational theories and practices.

50.809 Seminar in Adolescent Development

A seminar course with emphasis on discussion of major problem areas facing the adolescent in our society today. Particular emphasis will be given to social and emotional development. Included will be a survey of research in such areas as psychoanalysis, social learning, morality, and delinquency.

50.810 Psychology of Personality

An examination of theoretical approaches to the study of personality, with emphasis upon theories dealing with dynamic factors in personality development. The role of social and cultural factors, as well as implications of various theories for the therapeutic processes, will be considered.

50.811 Psychology of Cognition

A consideration of the processes involved in cognitive organization and functioning. Topics will include: language, concept formation, and problem solving.

50.812 History of Education

An opportunity to explore some of the historical roots of contemporary educational theory and practice, with a focus on selected aspects of educational history from antiquity to the present. Also, an opportunity to utilize any knowledge gained for the development of a personal educational position.

50.813 Philosophy of Education

An introduction to the basic precepts of philosophy as viable tools with which to build a philosophy of education. An analysis of major philosophic world-frames in their historical context; i.e. Aristotelian, Thomistic, idealistic, realistic, and pragmatic. An examination of philosophies of education which cover the broad spectrum of thought, ranging from authoritarian to democratic, determining from this examination where along the continuum to place the foundation from which to build one's own personal philosophy of education to be translated into conduct in the classroom.

50.814 The Nature and Theory of Psychological and Educational Measurement

4 Credit Hrs.

An examination of the logic of measurement and the nature of human capacities, aptitudes, and abilities. Characteristics of tests, ratings, questionnaires,

and similar instruments are reviewed with emphasis on their reliability, validity, and useability. Item analysis procedures and test standardization are covered. Open only to full-time Educational Research Technology students.

50.815 Research Design in Education

An introduction to scientific methods of research in education and related fields. Stress will be placed on a critical reading and understanding of research literature, formulating research hypotheses, the formulation of a research proposal, and carrying out an individual or group project.

A course in statistics or competence in this field is required prior to taking this offering. A no-credit, no-charge course in statistics has been arranged for this purpose and is available through the University's Center of Programmed Study. The regular tuition course, 50.816, is also available.

50.816 Educational Statistics

A first course in the statistical techniques used in educational research and in psychological testing. Measures of central tendency, variability, correlation, chi square, analysis of variance, and multiple regression will be among the topics considered. The student's mathematical background need not be beyond elementary algebra.

50.817 Research Problems in Education

An advanced course designed to provide students with research experience including evaluation of theoretical issues and their relevance, proposal writing, data gathering and analysis, report writing, and critical evaluation in depth of a current area of educational research interest.

50.818 Comparative Education

Introduction to foreign education to explore its relationships with the political, economic, social, and cultural milieu: Western and Eastern Europe, South America, and Africa will be considered.

50.819 Theories of Developmental Psychology

The major developmental theories and related research of Havighurst, Erickson, Piaget, and others.

Open only to candidates for the CAGS.

EDUCATIONAL RESEARCH TECHNOLOGY

50.840 Introduction to Educational Research

An introduction to the rationale and procedures for educational research: the use of theory in the formulation of research problems and hypotheses; review and summarization of research literature; isolation and definition of variables; and design of educational studies and experiments.

Open only to full time Educational Research Technology students.

50.841 Introduction to Educational Statistics

Basic descriptive statistics for measurement and research. Topics include use of statistical notation, measures of central tendency and variability, probability and sampling techniques, theoretical distributions, linear regression and correlation.

Open only to full-time Educational Research Technology students.

50.842 Intermediate Educational Statistics

Statistical inference of normal populations and discrete data; estimation; testing of hypotheses; multiple correlation; analysis of variance and covariance; contingency; the chi-square test and other non-parametric tests. Emphasis is given to application in educational research.

Open only to full-time Educational Research Technology students.

50.843 Research Methods I

Taken concurrently with the first field placement during the third quarter. Each student will, in collaboration with his internship supervisors, identify a relevant research problem. He will then review the research literature, design an appropriate methodology, and prepare a written research proposal for a study to be carried out in partial fulfillment of the degree requirements.

Open only to full-time Educational Research Technology students.

50.844 Research Methods II

Taken during the fourth quarter of study. During the first half of the quarter, each student will make detailed preparations for carrying out the proposal submitted in Research Methods I; e.g., prepare and pretest instruments for data collection, select the sample and make arrangements for data collection, prepare data analysis schedules, and plan details of statistical analysis. Individual conferences and group meetings will be held weekly. During the second half of the quarter, students will begin to carry out the research project. A written report of the completed project will be due at the conclusion of the fifth quarter.

Open only to full-time Educational Research Technology students.

50.845 Research Internship and Field Seminar I

6 Credit Hrs.

Students will be assigned to a variety of educational research agencies. For a period of 12 weeks, each student will work in one research setting gaining firsthand experiences with ongoing research. They will be closely supervised on a regular basis by staff members from within the agencies and by University faculty. Concurrent with their field placement all interns will be required to attend an internship seminar. The seminar is designed to help the student to develop an integrated, overall view of the internship experience through systematic observation and analysis of salient dimensions of agency research activities; e.g., the types of problems selected for investigation, the research strategies and tactics employed, the procedures utilized in disseminating research findings, the kinds of funding available from governmental and private agencies, and liaison relationships with the schools.

Open only to full-time Educational Research Technology students.

50.846 Research Internship and Field Seminar II

6 Credit Hrs.

Students will return to the agency in which they were originally placed. Part of the interns' time will be devoted to the completion of the research study initiated in Research Methods II. Close supervision of agency and University staff will continue. Concurrent with their field placement, all interns will be required to attend an internship seminar, which will be a continuation of Field Seminar I.

Open only to full-time Educational Research Technology students.

50.847 Elements of Machine Data Processing

A laboratory course designed to develop facility in the use of a wide range of data processing equipment in educational research. Students will be introduced to the basic principles of computer programming, but emphasis will be placed on the applicability and use of existing statistical programs.

Open only to full-time Educational Research Technology students.

50.891 Thesis

A research activity that may be elected by the student in lieu of two courses (8 quarter hours), with the approval and recommendation of the adviser.

50.899 Directed Study

This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the department. Prerequisites: approval of the chairman of the department and of the Director of the Graduate School of Education.

SPEECH PATHOLOGY AND AUDIOLOGY

50.901 Psychology of Exceptional Children

A survey and introductory course. The nature and characteristics of exceptional children: gifted, mentally retarded, emotionally disturbed, physically handicapped, visually handicapped, deaf and hard of hearing, speech-handicapped, brain-injured, and language-impaired.

50.902 Organization and Management of Public-School Speech-Therapy Programs

The process of identifying children who need speech therapy; planning therapy, organizing the program, organizational procedures, in-service training, speech therapy in the public schools, the clinical point of view in the process of learning.

50.903 Seminar: Cerebral Palsy

Neuromuscular involvements and concomittant language and speech disorders; intellectual deficits, psychological deviations, communicative disorders of a cerebral palsied population; testing, placement, and management of the cerebral palsied child and adult with emphasis on a multidisciplinary approach.

50.904 Seminar: Aphasia and Related Neurological Disturbances

Language disturbances associated with and related to brain damage; CVA, organic brain syndrome, space-occupying lesions, and prenatal, paranatal, and postnatal injuries; recent advances in aphasia; diagnostic and therapeutic techniques; coordinated approach.

50.905 Seminar: Functional and Organic Disorders of Voice

Physiology and neurology of the laryngeal mechanism; the laryngoscopic examination. Voice disorders as learned behavior as a result of organic, neurological, and/ psychological deviation. Evaluation, referral, and management.

50.906 Seminar: Language Disturbances in Children

Minimal cerebral dysfunction and its effect on language acquisition and use in the communicatively disturbed child; behavioral patterns of the nonverbal child; concepts of delayed development of language; evaluation and management.

50.911 Seminar: Stuttering

Contemporary research in the field of stuttering. Elaboration of theories and their related therapies. Psychodynamics of stuttering behavior and empirical problems.

50.912 Differential Diagnosis in Speech Pathology

Evaluation, interpretation, and integration of test results; the application of standard psychological tests to speech and hearing disorders; analysis of patients' premorbid and morbid histories, medical and psychological diagnoses; design and execution of therapeutic procedures; proper referral techniques and report writing; practicum situation.

50.913 Clinical Externship in Audiology.

No academic credit.

Involves 12 weeks of clinical practice in audiology in the Massachusetts Eye and Ear Infirmary five days per week, six hours per day, or a total of 420 hours of clinical externship. This externship would involve pre-operative and post-operative audiologic assessment. In addition, it involves participation in bi-monthly staffings of hearing problems at the Eye and Ear Infirmary. These staffings include the otologist, neurologist, audiologist, psychologist, and social worker. Primary emphasis is given to participation, observation, and staffing.

50.914 Clinical Audiometry I

The use of pure tone and speech reception instrumentation and hearing aid evaluation, the results and interpretation in the diagnosis of functional and organic disorders. Open to advanced undergraduates and graduates. Prerequisites: Introduction to Audiology and consent of instructor. Lectures, demonstration, observations, and practicum.

50.915 Clinical Audiology II

The process of identification and evaluation of hearing loss. Differential diagnosis. Tests for conductive, sensorineural, and retrocochlear involvements. A consideration of research findings in the area of hearing aid selection, auditory training, lip reading, and language training for hearing handicapped individuals. Prerequisites: Introduction to Audiology (see undergraduate Education catalog).

50.916 Test Procedures in Speech and Language Pathology

Procedures in evaluating organic and functional communication disorders using standard and nonstandard speech and language tests in University clinic situations. Demonstration and application of techniques, and objective reporting.

50.917 Advanced Anatomy, Neurology, and Physiology of Speech-Hearing Mechanism

Lectures and demonstrations by medical personnel. Emphasis on the head and neck. Admission by consent of adviser and medical supervisor. Prerequisites: Anatomy, Neurology, and Physiology of Speech and Hearing I; Introduction to Audiology, and Pathologies of the Ear. For advanced standing students.

50.918 Pathologies of the Ear

Lectures and observations in the organic and neurological pathologies of the ear; i.e., otitis media, Meniere's disease, and otosclerosis. Consideration of approaches to treatment. (medical setting)

50.919 Clinical Audiometry II

Specialized techniques (Bekey, FGSR, EEG, Group Testing, and screening) the results and interpretation in the diagnosis of functional and organic hearing disorders. Prerequisites: Introduction to Audiology and Audiometry I. Lectures, demonstration, observations, and practicum.

50.920 Physiological Acoustics

A study of the human ear as an acoustical, mechanical, and electrical system. Psychophysical dimensions, calibrating procedures, methodologies of standardization and quantification of auditory response.

50.921 Seminar in Audiology

The audiology department at the Massachusetts Eye and Ear Infirmary selects interesting audiological problem patients and brings them to the Infirmary for presentation to, and the scrutiny of, students. The medical and audiological staffs of the Eye and Ear Infirmary are in charge of this seminar. Covered are: clinical history, findings, diagnosis, and disposition of each patient. At each session, two or three patients are presented and discussed in detail. Prerequisite: Pathologies of the Ear and permission of program director.

50.922 Seminar: Functional and Organic Disorders of Speech

Diagnosis, prognosis, and remediation of articulatory disorders as learned behavior, as a result of organic and/or psychological deviation. Evaluation, referral, and management. Prerequisites: Anatomy I, Organic Disorders, and graduate standing.

50.923 Social Aspects of Communication Disorders

Effect of communication disorders on social functioning; the impact on child and family; sociological significance for parents; helping the family; kinds of help needed by family. Similarities and differences in services offered by the social caseworker, school, guidance counselor, vocational counselor, clinical psychologist, and the psychiatrist.

50.924 Seminar in Speech Pathology

A consideration of communication disorders of all types from a psychiatric viewpoint. A presentation of cases by the psychiatric and psychologic staff. Differential diagnosis, etiology, symptomatology, and management.

SPECIAL EDUCATION

Teaching the Deaf

50.925 Teaching Speech to Deaf Children

Utilization of vibration, visual aids, kinesthetic and proprioceptive cues, residual hearing and imitation in combination to elicit intelligible speech from the deaf.

50.926 Teaching Language and Reading to Deaf Children

Modern methods in use such as the Fitzgerald Key and the Natural Language Approach. Emphasis on how to use language in natural situations through lip reading and writing, with later emphasis on the formal presentation of language principles.

Methods used to develop reading experiences that focus on content rather than mechanics. Development of a balanced reading program that will provide adequate motivation, provision for evaluation, a wide variety of rich materials, and a well-organized sequence of reading experiences.

50.927 Methods and Materials in Deaf Education

Special methodologies in teaching the deaf. A wide view of the field and a comprehensive consideration of methods and materials. Emphasis placed on how to provide concrete experiences and activities, trips, and demonstrations to assist the child in understanding. There will also be demonstrations in the use of visual and auditory aids.

50.928 Speechreading and Auditory Training

Various speechreading methods, auditory training techniques and materials. An integrated approach to the treatment of the hearing handicapped.

Teaching the Emotionally Disturbed

50.930 Etiology, Dynamics, and Treatment of Emotional Disturbances in Children

The etiology, dynamics, diagnosis and treatment of emotional disturbance in children. Special attention to emotional blocks to learning. The different kinds of referral agencies and their role in treatment.

50.931 Teaching the Emotionally Disturbed: Problems and Strategies

Identification of problem areas in teaching and learning. The development of materials and teaching methods as instructional strategies to meet specific learning difficulties.

50.932 Group Dynamics

Emphasis on understanding the deeper questions of group growth, behavior, and action fundamental to developing solutions to the complex problems of group life. Students will learn to act democratically and as a group, to examine their strengths and weaknesses, to make decisions, to become alert to new ideas and actions, to discover the pulse of a group, and why one group is productive while another is nonproductive. The group will examine intensively such areas as group process, sociodrama, sociometric techniques, attitude testing, social action project development, and communication blocks in human relations.

50.933 Mental Health

Conditions leading to the most effective social adjustment. The relationship between the maturation process and mental health, the predeterminants of maladjustment and its prevention, special stress on those factors that encourage the attainment of emotional maturity. Information bearing on mental health from the fields of psychiatry, psychology, sociology, physiology, and medicine will be synthesized and evaluated.

50.935 Socio- and Psychodynamics of Family Life

This course will cover internal and external dynamics of family life and the significance of such dynamic features to emotional disturbance in the child.

Teaching the Mentally Retarded

50.940 Psychology of the Mentally Retarded

The nature and needs of the mentally retarded; degrees of retardation, their etiologies and concomitant behavioral disorders. The Strauss syndrome. The concept of intelligence. Psychological rationale for curricula development. The importance of multidisciplinary approach in a program for the retarded child and his family.

50.941 Methods and Materials — Trainable Retarded

Curriculum development and education methodologies for the trainable retarded. Organization and development of instruction for pupils with retarded mental development in special classes.

50.942 Methods and Materials — Educable Retarded

Curriculum development and education methodologies for the educable retarded. Organization and development in instruction for pupils with retarded mental development in special classes.

50.943 Industrial Arts and Crafts

A course designed to develop some fundamental skills in teachers of mentally retarded children so that the latter may receive instruction in vocational and home economics. Projects in chosen areas such as sewing, food preparation, and making basic arts and crafts.

50.944 Measurement and Evaluation in Special Education

This course emphasizes the evaluation of intelligence and the assessment of psycholinguistic abilities and disabilities of the mentally retarded. Such instruments as the Illinois Test of Psycholinguistic Abilities and the Peabody Picture Vocabulary Test are discussed. Also considered are the methodologies used in the measurement of evaluation of retarded children.

50.945 Rehabilitation for Special Education Teachers — Elective

The purpose of this course is to help develop effective working relationships between vocational rehabilitation counselors and special education teachers. The course is designed to expose these two groups of professional workers jointly to a number of similar educational experiences. Also, designed for elementary and secondary personnel who are concerned with exceptional children. Topics covered: vocational rehabilitation terms and concepts; background of vocational rehabilitation, including present legislation; teacher's role in vocational rehabilitation; understanding of the counseling process; and vocational rehabilitation resources for special educators.

Also other selected courses in Rehabilitation Administration, Deaf Education, and Speech Pathology.

Rehabilitation Administration

50.950 Introduction to Rehabilitation

An overview of and orientation to the field of rehabilitation, including its historical development, legislative involvement, psychological implications, and sociological dimensions. Emphasis is placed on coordinating and integrating services as they relate to the field of rehabilitation as a community process.

50.951 Principles of Medical Rehabilitation

The wide spectrum of disabilities that could profit from rehabilitation, including orthopedic, neurological, medical, surgical, and mental disabilities. Basic principles of medical rehabilitation important for the administrator to know will be presented. Psychological aspects of disability will also be discussed.

50.952 Vocational Rehabilitation and Social Services

The use of vocational rehabilitation as an effective rehabilitation process in federal, state, and private agencies. This will include programs for the physically handicapped, mentally retarded, emotionally disturbed, aging, welfare populations, youthful offenders, and community action programs. There will be special emphasis on the diagnostic, evaluative, counseling, and placement procedures used in developing such programs from the administrator's point of view.

50.953 Organization and Administrative Theory

The body of conceptual knowledge regarding organizational and administrative theory will be examined. Formal and informal organizations, organizations as social systems, status and role concepts, leadership in organizations, power structure, relationships to authority, decision-making, and communication in and between organizations.

50.954 Essentials of Supervision in Rehabilitation

The relationship between the rehabilitation counselor and his supervisor. The essentials of supervision that apply in all leader-subordinate relations. However, the course will be primarily clinically oriented to the actual problems that arise in the daily working situation. Case material reflecting real problems.

50.955 Administering a Rehabilitation Setting

Factors common to administering a rehabilitation agency, whether it be a state agency, private agency, sheltered workshop, rehabilitation center, or hospital rehabilitation program. Caseload management, budgeting, purchasing of supplies and equipment, job descriptions, recruiting personnel, program planning, building in-service training, human relations in administration, interpreting research data reports, etc., and applying these findings in a meaningful way.

50.956 Community Planning in Rehabilitation

What the administrator needs to know about community planning to plan a program in his state. Basic principles of community planning, community organization, and community dynamics, as well as interdisciplinary relations in rehabilitation. Examples of community planning from different rehabilitation agencies. The problems in the referral process among agencies.

50.957 Federal-State Relations in Rehabilitation

The complex network of federal-state relations and their implications for rehabilitation. Grant procedures, matching formulas, public relations and VRA directives, state and federal legislation pertinent to rehabilitation.

50.958 Social Welfare and Vocational Rehabilitation

Acquainting rehabilitation administrators with the broad field of social welfare. The course will review the historical backgrounds of the relationship between

vocational rehabilitation and social welfare and the more recent fast-moving developments in the relationship of these fields. Mutual referral processes between the welfare and rehabilitation groups will be considered.

50.959 Practicum in Rehabilitation Research

Under the supervision of the Regional Rehabilitation Institute, students will have an opportunity to develop a research design on some aspect of rehabilitation administration and to carry out the necessary research operations involved.

50.960 Practicum in Rehabilitation Administration

Students will be assigned to a variety of rehabilitation agencies for their practicum experience. Problem-solving relevant to experiences encountered in internship.

50.962 Administration of a Sheltered Workshop

Special problems of administering a sheltered workshop, such as community planning, work evaluation, job-training, labor relations, contracting, production, and occupational placement.

50.964 Rehabilitation and the Law

This course is designed to sensitize rehabilitation administrators to the impact of legislative developments upon the field of rehabilitation. Special emphasis will be placed on understanding the legal implications for rehabilitation of the latest Vocational Rehabilitation Administrative Amendments, workmen's compensation laws, eligibility determination criteria, and Social Security Amendments.

50.965 Occupational Placement

A study of the dynamics of moving the rehabilitation client into the world of work within the framework of the specific community structure. Development of facility in use of resource materials in occupational information, job description and analysis, performance appraisal, training, and vocational assessment. The personnel point of view toward the handicapped will be discussed and analyzed, and more effective placement practices will be developed.

50.991 Thesis

A research activity that may be elected by the student in lieu of two courses (8 quarter hours), with the approval and recommendation of the adviser.

50.999 Directed Study

This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the department. Prerequisites: approval of the chairman of the department and of the Director of the Graduate School of Education.

INSTRUCTION

51.800 Principles of Teaching

A consideration of the rational bases for effective teaching. Efforts are made to relate learning theory and educational objectives to various strategies and tactics of teaching. The functions of the teacher are examined as components of learner development.

51.801 Curriculum of the American School

Designed for in-service and prospective teachers, principals, and supervisors who seek experience and assistance in dealing with such problems as the following: improving and enriching the subject curriculum; developing a core curriculum.

51.802 Evaluation and Measurement

Evaluation techniques and principles for use in the classroom at all levels. The importance of establishing teaching objectives as a basis for evaluation. A brief review of statistical techniques necessary for dealing with objective-type test scores and marking procedures. Considerable emphasis will be placed on improving teacher-made tests, especially objective tests, and the student will be required to construct an objective test in his teaching field.

A course in statistics or competence in this field is strongly advised prior to taking this offering. A no-credit, no-charge course in statistics has been arranged for this purpose and is available through the University's Center of Programmed Study. The regular tuition course, 50.816, is also available.

51.803 Analysis of the Teaching-Learning Process

The relationship between instructional objectives and teaching behavior is examined. Specific implications of varying psychological orientations and current technological developments for teaching methods and materials are reviewed. Emphasis is placed on research problems and issues related to the instructional process.

Open only to full-time Educational Research Technology students.

51.805 Student Teaching with Related Seminar

(See requirements under Student Teaching)

A University-arranged practicum of observation and teaching in schools offering comprehensive programs within reasonable commuting distance of Northeastern. Participating on a full-time basis, the student is expected to develop planning and communication abilities within his major field. Biweekly seminars at the University provide additional opportunity to analyze theory-practice relationships and to examine generic problems of teaching.

51.806 Practicum and Seminars

(for teachers of the emotionally disturbed)

Practicum and Seminar I: Observation-in-depth — prolonged observation in selected settings — of pre-schoolers, elementary, and secondary school age students in community centers. An individual case study of one child will be worked up based on observations of the child and interviews with parents and community workers. The emphasis will be on the child in his social context in terms of his relationship to his parents, peers, and community.

Practicum and Seminars II and III: These are intermediate experiences between observation and full-time student teaching. Students will do individual tutoring, work with small groups, assist with recreational activities in at least two selected settings which differ in age of student group, (pre-school, elementary, secondary) and type of school (private and public; residential and day).

Practicum and Seminar IV: This is the culminating experience which places the student in full participation as a teacher in the school setting where the

student will seek appointment after graduation. This practicum is the student teaching requirement of the degree program in special education.

Full-time degree candidates must register for all four practica and seminars which carry a total of 8 quarter hours. They must be taken in sequence along with required related academic courses.

Two program designs are offered. The full-time program combines the academic curriculum with concurrent practicum experiences and seminars. This program aims to provide a range and depth of preparation which will enable the teacher to function in a wide variety of educational settings for the emotionally disturbed. A second program may be carried on a part-time basis. Although it is difficult to arrange part-time practicum experiences for full-time employed students, every effort will be made to arrange practicum experiences whenever possible. The required practicum in the program for part-time students is a full quarter of student teaching. Applications for student teaching must be received by the Director of the Graduate School of Education no later than October 15.

51.807 Practicum in Special Education

A combined course of teaching experiences with retarded children and experiences in performing differential diagnostic evaluations of retarded children in a clinical setting. Case analyses, staffings, program planning.

51.808 Student Teaching of the Deaf — Part I

An opportunity for observing and teaching deaf children at various levels, under regular supervision in the Beverly School for the Deaf.

51.810 Elementary Mathematics, Content, and Methods

The modern elementary mathematics curriculum and the conceptual approach to the meaningful teaching of arithmetic. Topics include sets, numeration systems, and operations with whole numbers and fractional numbers.

51.811 Elementary Number Concepts for Teachers

Prep. 51.810,
Elementary Mathematics

The concepts of the real number system and its subsystems underlying school mathematics.

51.812 Elementary Algebraic Concepts for Teachers

Prep. 51.811,
Elementary Number
Concepts for Teachers,
and high school algebra

The algebraic concepts underlying school mathematics, including variables, open sentences, order, modulo systems and polynomials.

51.813 Elementary Geometric Concepts for Teachers

Prep. 51.811,
Elementary Number
Concepts for Teachers,
and high school geometry

The geometric concepts underlying school mathematics, including abstraction, measurement, separations, congruence, similarity, and graphs.

51.815 Seminar in Mathematics and Science in the Elementary School

Prep. Approval of Instructor

The practical aspects of coordinating a K-6 science and mathematics program in a public-school district.

51.823 Modern High-School Mathematics, Content, and Methods

Study of students, teaching methods and courses in mathematics for grades 7-9, with emphasis on modern topics, including sets, numeration systems, number systems, and elementary algebra.

51.824 High-School Geometry, Advanced Content and Methods

Prep. 51.823, Modern High School Mathematics and teaching experience

A study of students, teaching methods, and courses in geometry with re-examination of selected background topics, including two-value logic, methods of proof, postulational systems, and analytical methods.

51.825 Seminar in Mathematics Education

Prep. Permission of Instructor

Each student is expected to analyze a mathematics teaching problem, to investigate existing solutions for it, and to prepare materials embodying his own proposed solution.

51.826 High-School Algebra, Advanced Content and Methods

Prep. 51.823, Modern High School Mathematics, a college course in algebra, and teaching experience

An examination of students, teaching methods, and modern second-year algebra programs with a re-examination of selected background topics, including linear and quadratic equations and inequalities, real and complex numbers, and vectors and matrices.

51.827 Advanced High-School Mathematics

Prep. 51.826, High School Algebra

An examination from an advanced viewpoint of topics found in high-school courses concerned with elementary functions and analytic geometry, including polynomial, rational, algebraic, logarithmic, exponential, and trigonometric functions, treated both algebraically and geometrically.

51.828 Elementary Calculus for Teachers

High-School Mathematics, and differential and integral calculus

An examination from an advanced viewpoint of selected topics in elementary calculus, including limits applied to formal differentiation, continuity, uniform continuity and intermediate values, boundedness and existence of extremes, differentiable functions, areas and integration, and properties of the Riemann integral.

51.829 General Mathematics, Content and Methods

An examination of students, teaching methods, and courses in general mathematics and related high-school courses.

51.830 Concepts of Earth Science for Elementary Teachers

Selected topics in the earth sciences considered from a philosophical and/or historical point of view, with laboratory work.

51.831 Concepts of Biology for Elementary Teachers

Selected topics in the biological sciences considered from a philosophical and/or historical point of view, with laboratory work.

51.832 Concepts of Physical Sciences for Elementary Teachers

Selected topics in the physical sciences considered from a philosophical and/or historical point of view, with laboratory work.

51.833 Teaching Elementary School Science Prep. 51.831, Concepts of Biology for Elementary Teachers; 51.832, Concepts of Physical Sciences for Elementary Teachers

The teaching of elementary school science from both a practical and philosophical point of view. Materials, resources, and methods, as well as several areas of science subject matter.

51.834 Elementary Science Curriculum

A general course in content and methods of teaching science in the elementary school classroom. Satisfies one elementary specialized-methods course requirement.

51.835 The Teaching of High School Science I

The first half of a two-quarter course, principally for secondary school teachers. Problems of observations of scientific facts, their discovery, the derivation of scientific principles from elaboration of hypotheses, experimentation and reasoning with these facts will be analyzed in terms of the learning process. The different fields of science will be considered, stressing especially their interdependence and their unity of methods and of reasoning.

51.835 The Teaching of High School Science I

Continuation of 51.835, The Teaching of High School Science I. During the second half of the course, plans for modern science courses in various fields will be elaborated.

51.840 The Teaching of English in the Secondary School

A basic methods and materials course designed to strengthen the teacher's understanding of the role and function of English in the curriculum. Emphasis will be placed upon literature and language skills including grammar, composition, spelling and reading. The course will include a review, analysis, and evaluation of current materials in secondary school English, and students will be assisted in the preparation and presentation of effective lesson plans.

51.845 The Teaching of Modern Languages in the Secondary School

Through the case method and group discussions, the most effective types of class activities, subject unit presentation, assignments, examinations, and aids used in teaching modern languages will be considered. The role of the language laboratory with its problems of selecting equipment, scheduling pupils, planning tapes and content of drill exercises, evaluating results and coordinating its functions with conventional classroom instructions will be discussed and demonstrated.

51.850 The Teaching of Social Studies

Developments in methods, materials, and curriculum. Consideration will be given to such topics as the following: the teacher of the social studies; objectives of social studies instruction; social studies programs; controversial issues; current events; visual and auditory aids; field trips; evaluation.

51.851 Current Political and Social Issues in the Social Studies

A content approach to problems of political and social significance which have contemporary relevance for teachers of the social studies on a secondary level.

51.855 The Teaching of General Business Subjects

Current trends in the teaching of social business subjects, such as general business, economics, economic geography, business law, and consumer education. Objectives, nature of subject matter, teaching aids and devices, tests and measurements, textbooks, and supplementary materials are studied.

51.861 Principles of Programmed Instruction

The development and current status of self-instructional devices. A survey of available programs and teaching machines, with emphasis on the details of the construction evaluation of programs.

51.891 Thesis

A research activity that may be elected by the student in lieu of two courses (8 quarter hours), with the approval and recommendation of the adviser.

51.899 Directed Study

This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the department. Prerequisites: approval of the chairman of the department and of the Director of the Graduate School of Education.

GRAPHIC SCIENCE**51.901 Descriptive Geometry I**

The theory of projection drawing, orthographic, axonometric, and perspective. Principle and auxiliary views involving problems of angularity, parallelism, perpendicularity.

51.902 Descriptive Geometry II

Advanced work involving intersections, developments, and topographical problems.

51.903 Graphics, Geometry and Mathematics

Relationship between graphical methods, geometry, and elements of algebra and trigonometry. Locus concepts applied to conics and other technical curves. Foncharal scales and their relation to technical charts, slide rules and elementary nomography.

51.904 Principles and Teaching of Technical Drawing

Selection of views sections and conventions, dimensions and specifications for shop-working detail and assembly drawings.

51.905 Machine Drawing and Design Prep. 51.905, Principles and Teaching of Technical Drawing or its equivalent
Basic production processes, common machine elements, working detail and assembly drawings and their relationships to the design of operation.

51.906 Graphical Analysis Prep. 51.903, Graphics, Geometry, and Mathematics or its equivalent
Curve fitting and empirical equations; design of more advanced slide rules and nomographs; graphical differentiation and integration; vector geometry and elementary mechanism analysis.

51.907 Electrical and Electronic Graphics
Graphics as used in the design and presentation of electrical, electromechanical and electronic devices including common symbols, specialized charts and diagrams.

51.908 Graphics in Architecture
Graphics as used in the design and development of architectural structures. From preliminary sketches to final presentation including site planning, detailed working drawings, delineation, entourage, etc.

51.909 Creative Projects in Graphics Prep. Approval of Instructor
Individually approved, graphics-related projects requiring the definition, analysis and research of a problem and the design development and final presentation of a solution. Problems of academic, pedagogical, construction, interdisciplinary, research, nature may be investigated.

51.910 Principles of Computer Programming
Methods and techniques of programming digital computers. Data processing and problem-solving in areas of science and mathematics using the Fortran language.

51.991 Thesis
A research activity that may be elected by the student in lieu of two courses (8 quarter hours), with the approval and recommendation of the adviser.

51.999 Directed Study
This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the department. Prerequisites: approval of the chairman of the department and of the Director of the Graduate School of Education.

EDUCATIONAL ADMINISTRATION

52.805 Problems in School Administration: A Simulated Experience Prep. 52.810, 52.811 or permission of instructor

The workshop is designed to place each student in a simulated decision-making situation. Background materials have been prepared which describe all aspects of a fictitious school system, including its publics, its policies, its certificated and non-certificated staff members, and its geographical and socio-economic makeup. These background data are disseminated through motion pictures, film strips, and taped interviews with influential people in the fictitious community as well as through written materials.

52.806 Directed Field Experiences in School Administration I
The Directed Field Experiences in School Administration is a course required

of all master's candidates who are majors in school administration. Students will be involved in such learning activities as aiding the administration of a public school system in surveying its educational programs, policies, or practices. These activities will be viewed as laboratory experiences to provide a basis for an increased understanding of administrative theory and practice.

52.807 Directed Field Experiences in School Administration II

A continuation of 52.806.

52.808 Seminar in Educational Administration

A culminating experience for students majoring in school administration at the master's level. A student is confronted with major issues facing the school and its administrators. Great emphasis is placed upon applying knowledge gained in previous administrative courses to an understanding of contemporary educational problems.

52.810 and 52.811 Leadership in Education: Parts I and II

A two-term course designed to introduce the student to concepts of formal organization. Presented in a two-part sequence, this core is prerequisite to further study in the Department of Educational Administration.

The core provides the student with an overview of formal organizations as social systems with special consideration given to the leadership function. Examination will be made of both the institutional and human dimensions as inter-related phenomena.

52.812 Educational Administration: An Overview of the Administrative Tasks

Prep. 52.810, 52.811

A survey of the operational areas of concern to the educational administrator. Included will be the following task areas: school-community relations, student personnel, staff personnel, curriculum and instruction, physical facilities, finance and business management, and organizational structure.

52.813 Instructional Leadership: Curriculum Development and Supervision

Prep. 52.810, 52.811

Views the leadership function and processes involved in the design and improvement of educational programs and instructional practices.

52.891 Thesis

A research activity that may be elected by the student in lieu of two courses (8 quarter hours), with the approval and recommendations of the adviser.

52.899 Directed Study

This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the department. Prerequisites: approval of the chairman of the department and of the Director of the Graduate School of Education.

CAGS COURSE OFFERINGS IN EDUCATIONAL ADMINISTRATION

52.830 Current Issues in Educational Administration

A seminar required of all students pursuing the CAGS. Critical and contemporary issues which face school administrators will be closely examined.

Teacher militancy, equal educational opportunity, federal aid, and cultural deprivation are present-day examples of topics that will be analyzed.

52.831 Innovation and Change in American Public Schools

A seminar required of all students pursuing the CAGS. Although major emphasis will be given to curriculum and instruction, attention will also be given to planned change in other critical areas. Included will be such concerns as team teaching, modular scheduling, non-gradedness, educational parks, programmed instruction, and in-service education.

52.832 The Process of Administration

A seminar required of all students pursuing the CAGS. Gaming, case analysis, and discussions will be utilized to gain insight into such issues as morale, satisfaction, perception, and decision-making.

52.833 Research and Statistical Methods for School Administrators

A study of the application of the methods of research and statistical techniques in the solution of school system problems. The role of research in the administrative decision-making process will be examined. The course of study will also focus on the various research designs the administrator may use in his position.

A specific topic of practical significance in school administration will be selected by the student and a design for the study of the topical problem will be developed. Research relevant to the topic will be evaluated.

Competence in the field of statistics is recommended prior to taking this offering.

52.834 Educational Finance

The study of school finance deals with the principles and problems of financing public education. Educational finance also considers the basic concepts of economics relative to the place of school finance in the field of public finance. The sources and rationale for public support of schools are examined. Selected state aid programs, capital outlay programs, and current practices and issues of local support are included in this study.

52.835 School Business Management

The practices and issues in the administration of school business affairs. The role of the business administrator and the educational budget will be examined. Included in this course will be elements of business affairs such as school accounting systems and data processing, auditing, financial reporting, and management of payrolls, insurance programs, transportation services, school food services.

52.836 Personnel Administration

Purposes, patterns, and issues in staff and pupil personnel administration programs are major considerations of the course. The student will pursue a course of study concerning the securing, developing, and retaining the skills, attitudes, and knowledge essential in the accomplishment of organizational goals.

52.837 School-Community Relations

The principles and practices of the intercommunications between the school and its public of the community. The student will study and gain some experience in the design and use of basic tools in a school-community relations program.

52.838 School Plant Planning

Development of a basic understanding of the elements of the process of planning for current and new school facilities. Students will be concerned with and study board of education policies, the educational program, school organization, school building utilization and adequacy, community analyses, and population studies and their interrelatedness in the planning process and procedures.

52.839 Operation and Maintenance of the School Plant

The major considerations of the course are the techniques and procedures involved in providing a clean, safe, and healthful physical environment for school personnel.

**52.840 Problems in School Administration:
A Simulated Experience — The Superintendency****52.841 Problems in School Administration:
A Simulated Experience — Assistant Superintendent for
Business Management****52.842 Problems in School Administration:
A Simulated Experience — Assistant Superintendent for
Instructional Services**

These courses are designed to place each student in a simulated decision-making situation in his area of concentration. Background materials have been prepared which describe all aspects of a fictitious school system including its publics, policies, certified and non-certified staff members, and the geographical and socio-economic makeup. These background data are disseminated through motion pictures, film strips, and taped interviews with influential people in this community as well as through written materials.

52.843 Administrative Internship

Supervised observation, internships, and externships in the various areas of emphasis. Designed to provide further practical experience in the student's special area.

52.844 School Law

The development of a basic understanding of federal and state laws that are applicable to education and educational personnel, as well as the legal prerogatives available to local boards of education.

COUNSELING**53.800 Foundations of Guidance**

A philosophically oriented course dealing with (1) the nature of the 20th Century context in which man now lives; (2) the image of humanness in the 20th

Century; and (3) the relation of these two aspects to the profession of guidance in the 20th Century.

53.801 Tests and Test Procedures

The principles and problems of psychological testing as applied to the work of the counselor are discussed. Some consideration is given to technical concepts as they apply to the treatment, use, understanding, and interpretation of test scores. The student is made familiar with some of the currently used tests of intelligence, scholastic aptitude, differential aptitudes, achievement, interest, and personality. Tests are evaluated for use in education and guidance. Problems of test interpretation are discussed briefly.

53.802 Vocational Development and Occupational Information

A dual-emphasis course dealing, first, with theories about how individuals make decisions concerning their choice of vocation, and second, with the kind of data which is needed to assist people with these decisions. This requisite data deals with the following areas: the relationship of social and economic change to occupational trends; the classification and description of occupational fields; methods of collecting, evaluating, filing, and disseminating vocational information; and the role of the counselor in fulfilling these functions.

53.803 Counseling I

Prep. 53.800, Foundations of Guidance,

which may be taken concurrently with permission of adviser

Theories of counseling and major issues relating to theories of counseling. Discussion of theories to be studied will be illustrated and their relevance to the counseling process discussed and examination of the philosophical assumptions underlying each theory.

53.804 Counseling II

Prep. 53.803, Counseling I;

53.801, Tests and Test Procedures.

53.801 may be taken concurrently with permission of adviser

A laboratory course for students in the secondary and higher education counseling programs. The counseling process and application of theory in developing a sound approach to the counseling relationship; the proper use of tests in counseling; role-playing and case studies.

53.805 Counseling Practicum

Prep. 53.803, Counseling I and

either 53.804, Counseling II or 53.810,

Counseling in the Elementary School. Students

must apply to the Department of Counselor

Education and receive permission to enroll for this course

The practicum in counseling represents the culmination of the counseling sequence; it consists of a supervised counseling experience in an actual guidance situation in a school, college, or private agency. The experience will include actual counseling time, individual student-supervisor conferences, and group seminars.

53.806 Field Work in Guidance

Prep. 53.802, Vocational Department

and Occupational Information, 53.803, Counseling I,

and 53.804, Counseling II, and permission of the instructor

For prospective counselors who have no previous formal guidance experience in a school situation. The course consists primarily of a supervised field placement for the purpose of obtaining experience in various guidance activities.

Provision will be made for some individual contacts with pupils, but the main emphasis will be on general guidance department functions. An attempt will be made, wherever possible, to place students in field situations consistent with their intended job goals.

53.807 Administration of Guidance Services Prep. 53.800, Foundations of Guidance, 53.801, Tests and Test Procedures, 53.802, Vocational Development and Occupational Information, 53.803, Counseling I

An advanced level guidance course designed to help meet the certification requirements for guidance directors in Massachusetts. The course will cover philosophies, principles, and methods of setting up and administering guidance programs in the public schools. Attention will be given to the various pupil personnel functionaries in the schools, their integration into the guidance team, and their relationship to the total school program. Scheduling guidance activities, setting up testing programs, developing record systems, and hiring and supervising staff will be among the topics discussed.

53.808 Group Counseling Prep. 53.803, Counseling I
Theory, research, and practice of counseling with groups of students at all levels from elementary school to college. Also, a brief consideration of group-guidance practices in the elementary and secondary schools, but with emphasis on developing initial knowledge and skills in group counseling.

53.809 Student Personnel Work in Higher Education Prep. 53.800, Foundations of Guidance

An introduction to the philosophy and practice of student personnel work in colleges and universities. Various student personnel services such as admissions, housing, student activities, health services, and faculty advising are examined. There is discussion of such general problems as academic climate, student unrest, and student censorship as they relate to the responsibility of the student personnel worker.

53.810 Counseling in the Elementary School Prep. 53.801, Tests and Test Procedures, 53.803, Counseling I.
53.801 may be taken concurrently with permission of adviser

A course for those planning to enter elementary school counseling. Consideration of counselor role at the elementary level, counseling practices, and a study of counseling cases. This course is preparation for the practicum.

53.823 Measurement of Intelligence: Stanford-Binet Scales Prep. 53.801, Tests and Test Procedures

Preparation to administer, score, and interpret the Stanford-Binet Test of Intelligence. Consideration of theories of intelligence as they apply to the Binet scales and their development; use of the test in educational settings. Each student will be required to administer and score 25 tests.

53.824 Measurement of Intelligence: Wechsler Scales Prep. 53.801, Tests and Test Procedures

Preparation to administer, score, and interpret the Wechsler Adult Intelligence Scale (WAIS) and the Wechsler Intelligence Scale for Children (WISC). Study of the theory and development of the test; its use in education and counseling. Each student will be required to administer 25 tests.

53.891 Thesis

A research activity that may be elected by the student in lieu of two courses (8 quarter hours), with the approval and recommendation of the adviser.

53.899 Directed Study

This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the department. Prerequisites: approval of the chairman of the department and of the Director of the Graduate School of Education.

CAGS COURSE OFFERINGS IN COUNSELING**53.830 Advanced Seminar and Field Work**

Prep. Counseling Practicum
or the equivalent in experience

Students will be given a field placement in September that is consistent with their professional goals. They will engage in counseling and other related activities under supervision for the remainder of the academic year. This placement may be shifted during the year in order to meet varied student needs. Accompanying the field experience will be a regular seminar during which time a variety of professional topics and issues will be considered. Successful completion of this course is required before the student will be permitted to take the qualifying examination.

53.831 Advanced Group Counseling

Prep. 53.808, Group Counseling;
53.805, Counseling Practicum

A continuation of content presented in Group Counseling, with emphasis on developing some skill in group counseling at a variety of age levels. Students will engage in group counseling under supervision as well as participate in T-group experiences in the course. Research in group counseling will be discussed.

53.832 Play Therapy

Prep. Permission of Instructor

The principles and practice of play therapy with essentially normal children. Some laboratory experience with play therapy will be provided. Research in the area of play therapy will be examined.

53.833 Seminar in Counseling Supervision and In-Service Education

Prep. Permission of Instructor

Methods of improving the effectiveness of school counselors' skills in counseling and other aspects of guidance work, and of involving counselors in the improvement of the guidance program, and of enhancing the personal growth of the counselor.

READING**54.800 Introductory Reading and Language Skills for Teacher Preparation Majors**

The introductory reading and language skills course for elementary teacher certification programs only. Techniques for teaching aural comprehension, speaking ability, reading and literature, grammar, spelling, and written composition. Integration of reading and language skills. Examination of word recognition, meanings, study skills, speed, and fluency growth areas of reading. Development of reading and language skills plans for classroom use.

54.801 Teaching Reading and Language Skills: Elementary Level

Basic developmental reading-language skills course for elementary teachers.

Essential reading, writing, speaking, and listening skills are presented and analyzed in the light of the most recent concepts of integrated learning at various grade levels. Practical work in developing well-integrated reading-language-skills plans for classroom use with average and above-average pupils will be emphasized. Review of various types of instructional materials currently used in elementary classrooms, and a discussion of grouping practices.

**54.802 Introduction to Reading Disability:
Elementary and Secondary Levels**

Prep. 54.801 or both
54.135 and 54.136

Second course in the reading specialization sequence. Description and analysis of the reading processes in retarded readers. Review and evaluation of basic causes of reading retardation. Examination of the essential processes and skills involved in word recognition, meanings, study skills, rate and fluency, and related language skills. This course covers both elementary and secondary problem readers.

54.804 Diagnosis and Correction of Reading Disability I

Prep. 54.801, 54.802

Third course in reading specialization sequence at elementary or secondary levels. Diagnosis of specific reading, language, and study problems at all levels, integrated with corrective measures. A log or journal representing a comprehensive diagnostic and corrective program carried on with an individual during the year will be submitted and evaluated.

54.805 Diagnosis and Correction of Reading Disability II

Prep. 54.801,
54.802, 54.804

Continuation of 54.804. Greater emphasis on corrective techniques with retarded readers. Writing of case studies. Log or journal describing diagnostic and corrective program and a case study evaluating progress will be submitted and evaluated.

54.806 Practicum

Prep. 54.801, 54.802, 54.804, 54.805

This practicum involves classroom work and field work under supervision of the departmental staff. Class work will involve demonstration lessons by the professor with a group of youngsters during the quarter. These demonstrations will be followed by critiques and evaluations of methods, materials and relevance of corrective work to diagnostic data. For part of the class time, students will work with individuals and/or small groups as part of the session. Field work will be done with groups of students who have been diagnosed as reading and language skills problems. The professor as well as other members of the reading department will visit, observe and participate in on-the-spot reviews and discussions of the lesson presented. Approximately two-thirds of the quarter's work will be in supervised field work, focussing on the ability to translate diagnostic data into usable and effective corrective programs with groups of reading problems.

54.808 Teaching Reading and Language Skills: Secondary Level

An introductory course in the teaching of reading in grades 7-12. A developmental reading program for secondary students will be discussed, including basic growth areas in reading and language skills (writing, spelling, grammar, etc.); review of available books and materials for instructional purposes; grouping practices; relation of developmental reading program to English courses; lesson planning.

54.809 Supervision and Administration of Reading Programs

Prep. All basic courses in Reading

This course is for graduate students who seek to become Reading Supervisors, Reading Consultants, or Directors of Reading programs in schools or in public or private agencies, e.g., ABCD, Title I, III, IIIB, Upward Bound, Headstart programs. This will cover programs at all levels from pre-school to college and adult basic education programs. Basic principles and practices for organizing the resources, facilities, and materials available to meet reading and language skills needs of students, will be taught. Basic administrative information on sources of public funds, proposal writing, screening students for instruction, scheduling, general logistics for setting up a program from scratch. This will include tutorial projects and the possible use of neighborhood aides in special reading and/or literacy programs.

54.810 Clinical Practice

Prep. Approval of Instructor

A special, advanced seminar in diagnostic methods and materials, including those classified as perceptually handicapped, non-English speaking persons, severe reading and language problems. The content of this seminar will change as new diagnoses and/or corrective methods and materials develop in the field of Reading. Much more intensive work, which will probe more deeply into causes and cures of reading problems.

54.811 Youth Literature

This course will investigate, review and develop methods of utilizing supplementary reading books and materials for school children at all levels. Plans for teaching with such additional materials will be developed, and where possible, implemented under supervision. This will also include books and materials developed for disadvantaged populations. Both remedial and corrective programs will be studied and used.

54.891 Thesis

A research activity that may be elected by the student in lieu of two courses (8 quarter hours), with the approval and recommendation of the adviser.

54.899 Directed Study

This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the department. Prerequisites: approval of the chairman of the department and of the Director of the Graduate School of Education.

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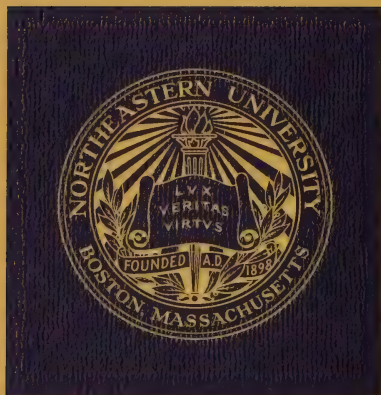
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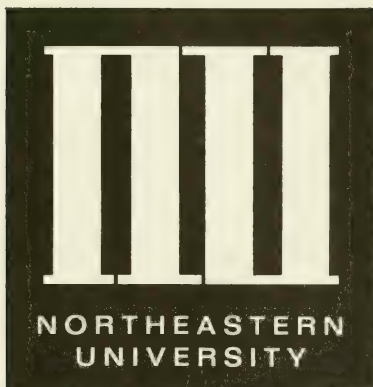


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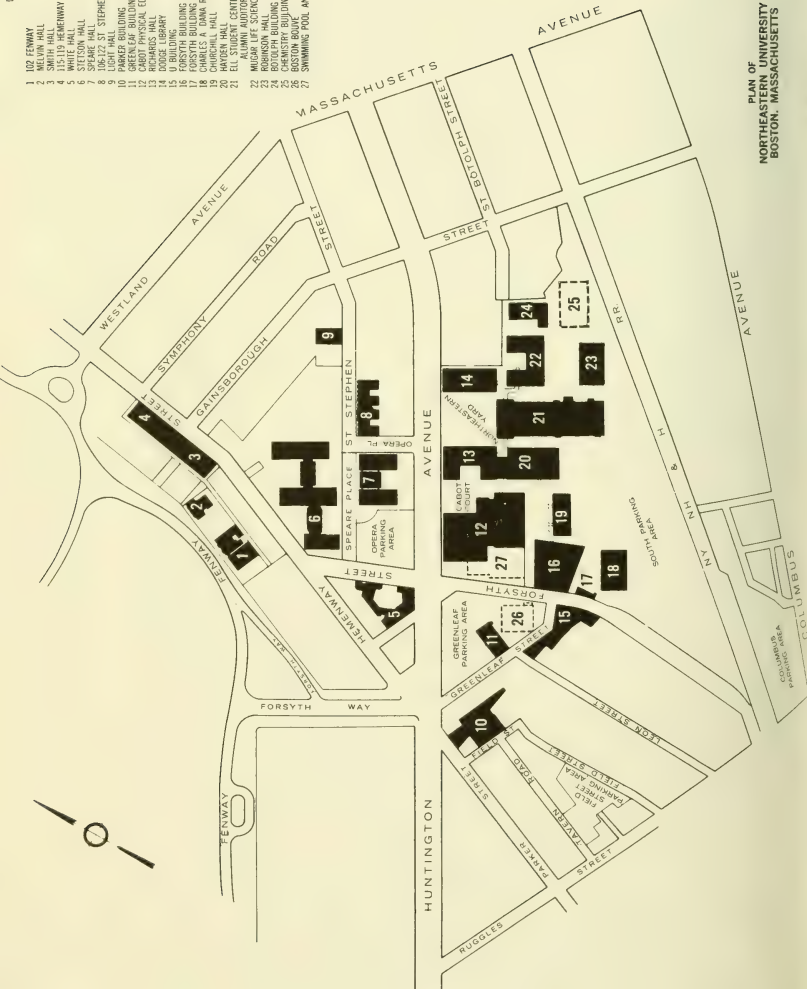
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PLAN OF
NORTHEASTERN UNIVERSITY
BOSTON, MASSACHUSETTS

ACADEMIC CALENDAR 1968-69

Summer Session 1968

Registration Period for Former Students	Monday-Friday	May 27-June 7
Interview and Registration Period for New Students*	Monday-Friday	June 3-June 7
Classes Begin	Monday	June 17
Independence Day, No Classes	Thursday	July 4
Classes End	Tuesday	July 23
Examination Period	Wednesday-Saturday	July 24-July 27

Fall Quarter 1968

Registration Period for Former Students	Monday-Saturday	Aug. 12-Aug. 31
Interview and Registration Period For New Students*	Monday-Saturday	Aug. 19-Sept. 7
Classes Begin	Monday	Sept. 16
Columbus Day, No Classes	Saturday	Oct. 12
Veterans' Day, No Classes	Monday	Nov. 11
Thanksgiving Recess, No Classes	Tuesday-Friday	Nov. 26-29
Examination Period†	Monday-Friday	Dec. 2-6

Winter Quarter 1968-69

Change of Registration for Former Students	Wednesday-Wednesday	Nov. 20-Nov. 27
Interview and Registration Period for New Students*	Wednesday-Wednesday	Nov. 20-Nov. 27
Classes Begin	Monday	Dec. 9
Christmas Vacation, No Classes	Saturday-Wednesday	Dec. 21-Jan. 1
Washington's Birthday, No Classes	Saturday	Feb. 22
Examination Period	Monday-Friday	March 3-March 7

Spring Quarter 1969

Change of Registration for Former Students	Monday-Friday	Feb. 24-Feb. 28
Classes Begin	Monday	March 17
Patriots' Day, No Classes	Saturday	April 19
Final Grades Due in Registrar's Office for June Graduates Taking Third-Quarter Courses	Friday	May 23
Memorial Day, No Classes	Friday	May 30
Examination Period	Monday-Friday	June 2-June 6

*Appointments for interviews with new students must be made at least four days before the date of the interview.

†Examinations for day classes will be held in accordance with the undergraduate examination schedule.

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Louis W. Cabot
Byron K. Elliott
Chandler Hovey
E. Douglas Kenna
John Lowell
Lawrence H. Martin
Augustin H. Parker, Jr.
William M. Rand
Earl P. Stevenson
Earl H. Thomson

Asa S. Knowles, *ex officio*†

EXECUTIVE COMMITTEE

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Samuel A. Groves, *Vice Chairman*

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Lawrence H. Martin
William M. Rand

Frank L. Richardson
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Byron K. Elliott, Asa S. Knowles, *ex officio*

*President Emeritus of the University

†President of the University

ADMINISTRATIVE ORGANIZATION

OFFICERS OF THE UNIVERSITY

Asa S. Knowles, A.B., A.M., LL.D., Litt.D., Sc.D., D.B.A., D.S.Bus.Ed.	President
Carl S. Ell, A.B. M.S., Sc.D., L.H.D., LL.D., D.S.Ed.	President Emeritus
William C. White, B.S., Ed.M., Eng.D.	Executive Vice President
Lincoln C. Bateson, B.B.A., M.B.A.	Vice President — Finance
Jack R. Bohlen, B.B.A.	Vice President for Development
Arthur E. Fitzgerald, E.E., S.M., Sc.D.	Vice President for Academic Affairs and Dean of Faculty
Gilbert G. MacDonald, B.I.E., Ed.M.	Vice President for Student Affairs and Dean of Students
Edward S. Parsons, B.S., Ed.M.	Business Manager
Kenneth G. Ryder, A.B., M.A.	Vice President and Dean of University Administration
Loring M. Thompson, B.S., M.S., M.A., Ph.D.	Vice President and Dean of Planning
Roy L. Wooldridge, B.S., Ed.M.	Vice President and Dean of Cooperative Education

ACADEMIC DEANS AND PRINCIPAL ADMINISTRATIVE OFFICERS

Catherine L. Allen, B.S., M.A., D.Ed.	Dean of Boston-Bouvé College
John S. Bailey, B.S., M.B.A.	Dean of University College
Kenneth W. Ballou, A.B., Ed.M.	Dean of University Relations
Bernard J. Brent, B.S., M.S., Ph.D.	Director of the Graduate School of Pharmaceutical Sciences
Geoffrey Crofts, B.Comm., F.S.A.	Dean and Director of the Graduate School of Actuarial Science
Ray C. Dethy, B.Sc., M.A., Ph.D.	Assistant Dean of Education and Director of the Graduate School of Education
Martin W. Essigmann, S.B., M.S.	Dean of Research
Gilbert C. Garland, B.S., Ed.M., Ed.D.	Dean of Admissions
James E. Gilbert, B.S., M.A., Sc.D.	Director of the Office of Educational Resources
Joseph M. Golemme, S.B., M.A., C.P.A.	Director of the Graduate School of Professional Accounting

George W. Hankinson, A.B., B.S., M.S.	Assistant Dean of Engineering and Director of the Graduate School of Engineering
Charles W. Havice, A.B., M.A., S.T.B., Ph.D., D.D.	Dean of Chapel
James S. Hekimian, A.B., M.B.A., D.B.A.	Dean of Business Administration
Israel Katz, B.S.M.E., M.M.E.	Dean of Continuing Education
LeRoy C. Keagle, B.S., Ph.D.	Dean of Pharmacy
William F. King, B.S., M.S.	Acting Dean of Engineering
Wilfred S. Lake, A.B., M.A., Ph.D.	Dean of Liberal Arts
Frank E. Marsh, Jr., A.B., M.Ed., D.Ed.	Dean of Education
Daniel J. McCarthy, A.B., M.B.A., D.B.A.	Associate Dean of Business Administration and Director of the Graduate School of Business Administration
Roland H. Moody, A.B., B.L.S.	Director of the University Library
Rudolph M. Morris, B.S., Ed.M.	University Registrar
Thomas J. O'Toole, A.B., LL.B., M.A.	Dean of Law
Daniel J. Roberts, Jr., B.S., M.B.A., Ed.M.	Comptroller and Assistant Director of Finance
Gustav S. Rook, B.S., Ed.M.	Dean of Lincoln College
Robert Sheehan, A.B., M.A.	Acting Dean of Criminal Justice
Arthur A. Vernon, B.S., M.S., Ph.D.	Dean of Graduate Division
Charlotte E. Voss, B.S., M.S., Ed.D.	Dean of Nursing
Louis Vrettos, B.S., M.A., Ed.D.	Dean of Instruction and Director of the Suburban Campus

GENERAL UNIVERSITY COMMITTEES

THE EXECUTIVE COUNCIL

Asa S. Knowles, *Chairman*
William C. White, *Vice Chairman*
Loring M. Thompson, *Secretary*

Lincoln C. Bateson	Edward S. Parsons
Arthur E. Fitzgerald	Kenneth G. Ryder

THE UNIVERSITY COUNCIL

William C. White, *Chairman*
Loring M. Thompson, *Secretary*

Kenneth W. Ballou	Roland H. Moody
Lincoln C. Bateson	Rudolph M. Morris
Jack R. Bohlen	Edward S. Parsons
Martin W. Essigmann	Daniel J. Roberts, Jr.
Arthur E. Fitzgerald	Kenneth G. Ryder
Gilbert C. Garland	Arthur A. Vernon
James E. Gilbert	Roy L. Wooldridge
Gilbert G. MacDonald	

Asa S. Knowles, *ex officio*

THE ACADEMIC COUNCIL

Arthur E. Fitzgerald, *Chairman*
Loring M. Thompson, *Secretary*

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John S. Bailey	Roland H. Moody
Geoffrey Crofts	Rudolph M. Morris
Martin W. Essigmann	Thomas J. O'Toole
Gilbert C. Garland	Gustav S. Rook
James E. Gilbert	Kenneth G. Ryder
James S. Hekimian	Robert Sheehan
Israel Katz	Arthur A. Vernon
LeRoy C. Keagle	Charlotte E. Voss
William F. King	Louis Vrettos
Wilfred S. Lake	Roy L. Wooldridge
Gilbert G. MacDonald	

Asa S. Knowles, William C. White, *ex officio*

THE FACULTY SENATE

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Ralph S. Blanchard, Jr.
Lydia A. Bosanko
Russell E. Brillhart
Marcello J. Carrabes
Robert Cord
Goldie Crocker
James M. Feldman
Robert J. Ferullo
*Arthur E. Fitzgerald
Walter L. Fogg
Norbert L. Fullington
Charles M. Goolsby
Arvin Grabel
E. Vaughn Gulo
Charles F. Haley
*James S. Hekimian
Sidney Herman
Richard Higgins
George Khiralla

*William F. King
*Wilfred S. Lake
Frank F. Lee
Richard Lindhe
*Gilbert G. MacDonald
Wesley Marple
*Thomas E. McMahon
*Rudolph M. Morris
Harold Naidus
Saul Namyet
Paul M. Pratt
Wilfred J. Remillard
Morton Rubin
*Kenneth G. Ryder
Giuliano Sorani
Richard R. Stewart
*Loring M. Thompson
Harold A. Walker
Roy Weinstein
Henry O. Werntz

Presiding Officer

Asa S. Knowles

or

Arthur E. Fitzgerald

*Appointed by the President

GRADUATE DIVISION ORGANIZATION

ADMINISTRATION

William T. Archey, A.B.	Assistant in the Graduate School of Business Administration
Bernard J. Brent, B.S., M.S., Ph.D.	Director of the Graduate School of Pharmaceutical Sciences
Geoffrey Crofts, B.Comm., F.S.A.	Director of the Graduate School of Actuarial Science
Ray C. Dethy, B.S., M.A., Ph.D.	Director of the Graduate School of Education
Joseph M. Golemme, B.S., M.A.	Director of the Graduate School of Professional Accounting
Charles F. Haley, B.S., M.Ed.	Associate Director of the Graduate School of Education
George W. Hankinson, A.B., S.B., M.S.	Director of the Graduate School of Engineering
John W. Jordan, B.S., M.Ed.	Administrative Assistant in Business Administration
Andre Priem, B.B.A., M.A.	Director of the Graduate School of Business Administration
Joseph A. Ross, B.S. Ed.	Administrative Assistant in the Graduate Division
Richard E. Sprague, B.S., B.B.A., M.B.A., Ed.M.	Administrative Assistant in the Graduate Division
Arthur A. Vernon, B.S., M.S., Ph.D.	Dean of the Graduate Division and Director of the Graduate School of Arts and Sciences
Janice Walker, A.B.	Registrar of the Graduate Division
Carol A. Weiss, A.B.	Assistant in the Graduate School of Education

UNIVERSITY GRADUATE COUNCIL

1967-68

The responsibility of the Council is the determination of broad policies and regulations governing the conduct of graduate work. All new graduate programs must be approved by the Council.

Administrative Members

Arthur A. Vernon, Chairman	Dean of the Graduate Division and Director of the Graduate School of Arts and Sciences
Janice Walker, Secretary	Registrar of the Graduate Division

Bernard J. Brent	Professor of Medicinal Chemistry and Director of the Graduate School of Pharmaceutical Sciences
Geoffrey Crofts	Dean of the Graduate School of Actuarial Science
Ray C. Dethy	Assistant Dean of Education and Director of the Graduate School of Education
Arthur E. Fitzgerald	Vice President and Dean of the Faculty
Joseph M. Golemme	Director of the Graduate School of Professional Accounting
George W. Hankinson	Assistant Dean of Engineering and Director of the Graduate School of Engineering
James S. Hekimian	Dean of Business Administration
LeRoy C. Keagle	Dean of Pharmacy
William F. King	Acting Dean of Engineering
Wilfred S. Lake	Dean of Liberal Arts
Frank E. Marsh, Jr.	Dean of Education
Daniel J. McCarthy	Associate Dean of Business Administration and Director of the Graduate School of Business Administration
Kenneth G. Ryder	Vice President and Dean of Administration
Roy L. Wooldridge	Vice President and Dean of Cooperative Education

**Elected Faculty Members
(Terms Expire September 1968)**

Wendell R. Brown	Associate Professor of Social Science Education
John F. Dunn	Professor of Mechanical Engineering
George M. Krause	Professor of Pharmacy
Robert W. Mullins	Associate Professor of Management
Robert J. Minichiello	Associate Professor of Marketing
Harold R. Raemer	Professor of Electrical Engineering and Chairman of the Department
Raymond H. Robinson	Professor of History and Chairman of the Department
George B. Rochfort, Jr.	Associate Professor of Education
Elliot Spector	Professor of Pharmacology
A. Bertrand Warren	Professor of Psychology and Chairman of the Department

(Terms Expire September 1969)

James T. Barrs	Professor of English
Robert J. Ferullo	Associate Professor of Special Education
Austin W. Fisher	Professor of Engineering Management
Bernard M. Goodwin	Associate Professor of Chemical Engineering
Melvin Howards	Director of the Center for Educational Development
A. Howard Myers	Professor of Industrial Relations
John F. Reinhard	Professor of Pharmacology and Chairman of the Department
John N. Samaras	Associate Professor of Management
Robert A. Shepard	Professor of Chemistry and Chairman of the Department
Albert H. Soloway	Associate Professor of Medicinal Chemistry

**COMMITTEE ON GRADUATE STUDY IN ENGINEERING
1967-68**

George W. Hankinson, A.B., S.B., M.S., Chairman	Assistant Dean of Engineering and Director of the Graduate School of Engineering and Professor of Civil Engineering
Arthur R. Foster, B.S., M.Eng.	Professor of Mechanical Engineering and Chairman of the Department
William F. King, S.B., M.S.	Acting Dean of Engineering
James M. Moore, B.S., M.S., Ph.D.	Professor of Industrial Engineering and Chairman of the Department
Harold R. Raemer, B.S., M.S., Ph.D.	Professor of Electrical Engineering and Chairman of the Department
Ernest L. Spencer, S.B., M.S.	Professor of Civil Engineering and Chairman of the Department
Ralph A. Troupe, B.S., M.S., Ph.D.	Professor of Chemical Engineering and Chairman of the Department
Arthur A. Vernon, S.B., M.S., Ph.D.	Dean of the Graduate Division
Alvah K. Borman, B.S., Ed.M., Ex Officio	Director of Graduate Placement Services and Professor of Cooperative Education

Aims and Scope of the University

Founded in 1898, Northeastern University is incorporated as a privately endowed nonsectarian institution of higher learning under the General Laws of Massachusetts. The State Legislature by special enactment has given the University general degree-granting powers. The University is governed by a Board of Trustees elected by and from the Northeastern University Corporation, which is composed of more than 150 distinguished business and professional men.

From its beginning Northeastern University has had as its dominant purpose the discovery of community educational needs and the meeting of these in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has sought to pioneer new areas of educational service.

A distinctive feature of Northeastern University is its Cooperative Plan, initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922), Liberal Arts (1935), Education (1953), Pharmacy (1962), Nursing (1964), and Boston-Bouvé College (1964). This educational method enables students to gain valuable practical experience as an integral part of their college programs and also provides the means by which they may contribute substantially to the financing of their education. The Plan has been extended to the graduate level in engineering, mathematics, sociology, actuarial science, the pharmaceutical sciences, and professional accounting.

In the field of adult education, programs of study have been developed to meet a variety of needs. Since 1906 evening curricula have been offered leading to the bachelor's degree. Programs in the arts and sciences, engineering, various fields of business, law enforcement and security, and other areas have been carefully planned to serve mature students who are employed full time during the day and want to broaden their educational background by part-time study. All formal courses of

study leading to degrees through evening programs are approved by the Basic College faculties concerned and are subject to the same quantitative and qualitative standards as the regular day curricula.

The following is a brief outline of the aims and scope of the University's programs.

UNDERGRADUATE COLLEGES

BOSTON-BOUVE COLLEGE

Boston-Bouvé College offers three major programs of study — physical education, recreation education, and physical therapy. Students earn the degree of Bachelor of Science in Education.

The combined programs of liberal arts, science, and professional preparation include field experience and student teaching, and leadership training in camping and outdoor education at the Warren Center for Physical Education and Recreation in Ashland. In accordance with Northeastern's Cooperative Plan of Education, students are offered varied opportunities for alternate plans of work-study experience during upper-class years.

THE COLLEGE OF BUSINESS ADMINISTRATION

The College of Business Administration offers programs of study in the principal fields of business leading to the degree of Bachelor of Science in Business Administration. These programs are offered on the five-year Cooperative Plan, under which students gain substantial practical experience in the fields for which they are preparing as an integral part of their undergraduate course of study.

The College also sponsors a Management Institute which offers various special courses for business and industrial executives. One phase of the Institute's work is carried on by the Center for Management Development, which annually conducts an intensive program designed to provide professional growth for middle-management executives who will ultimately be called upon to carry broader executive responsibilities. The plan of instruction, based on a modification of the Northeastern Cooperative Program, permits the participants to maintain their job responsibilities during the six-month period of the course. The Management Development Program is conducted at Andover, Massachusetts, on the campus of Andover Academy.

A Bureau of Business and Economic Research, concerned particularly with problems of the New England region, is an integral part of the College. The Bureau conducts research projects under faculty leadership using undergraduate and graduate cooperative students as research assistants.

COLLEGE OF CRIMINAL JUSTICE

The College of Criminal Justice offers full-time day curricula on the Cooperative Plan leading to the degree of Bachelor of Science with concentration in the field of law enforcement.

THE COLLEGE OF EDUCATION

The College of Education offers programs leading to the degree of Bachelor of Science in Education. These are designed particularly to meet the needs of high school graduates who desire to prepare themselves for teaching or administrative positions in elementary and secondary schools. Curricula are offered on the five-year Cooperative Plan, which provides for employment in libraries, social service agencies, and school systems.

THE COLLEGE OF ENGINEERING

The College of Engineering offers five-year cooperative curricula in civil, mechanical, electrical, chemical, industrial, and biomedical engineering leading to the degree of Bachelor of Science with specification according to the engineering department in which the student qualifies. A six-year program in power systems engineering in collaboration with public utilities leads to both the bachelor's and master's degree in electrical engineering. The College also offers during evening hours a part-time program leading to the degree of Bachelor of Science in Electrical Engineering. This program extends over eight years, covers the identical courses given in the day cooperative curriculum, and meets the same qualitative and quantitative standards of scholarship.

THE COLLEGE OF LIBERAL ARTS

The College of Liberal Arts offers majors in the usual field of the arts and sciences leading to the degree of Bachelor of Arts. With the exception of preprofessional programs, curricula are normally five years in length and operated on the Cooperative Plan.

LINCOLN COLLEGE

Lincoln College offers technology programs leading to the Associate in Engineering and Bachelor of Engineering Technology degrees. It also offers science technology and paramedical technology programs leading to the Associate in Science degree.

In addition to its traditional curricula, Lincoln College offers interdisciplinary and certificate programs providing technological and professional

development opportunities to meet the special needs of part-time students.

THE COLLEGE OF NURSING

The College of Nursing offers two separate and distinct programs of study, both organized on the Cooperative Plan:

- (a) A three-year curriculum in preparation for the R.N. Examinations and leading to the Associate in Science degree.
- (b) A five-year curriculum also preparing students for the R.N. Examinations, and leading to the degree of Bachelor of Science in Nursing.

Five of Boston's leading hospitals — Beth Israel, Children's Hospital Medical Center, New England Deaconess, Peter Bent Brigham, and Massachusetts General — collaborate with Northeastern by providing suitable cooperative work opportunities during the upper-class years of these programs.

THE COLLEGE OF PHARMACY

The College of Pharmacy offers five-year cooperative curricula leading to the degree of Bachelor of Science in Pharmacy. Cooperative placement begins with the sophomore year and continues for three years, the senior year being devoted to full-time study at the University.

UNIVERSITY COLLEGE

University College, so called because it draws upon the resources of the other colleges of the University, offers courses of study leading to certificates, Associate in Science and Bachelor of Science degrees. University College offers both day and evening programs designed specifically to meet the needs of adult students who wish to undertake part-time curricula during late afternoon or evening hours and on Saturdays. In cooperation with the Forsyth School for Dental Hygienists, University College offers a two-year day curriculum leading to the Associate in Science degree.

Quality standards of instruction and requirements for the degrees offered by University College are wholly consistent with those of the other colleges of the University. University College does not duplicate the offerings of the eight Basic Colleges but provides curricula which cut across traditional subject-matter areas to meet the particular needs of adults desiring formal programs of professional development on a part-time basis, or of young people enrolled in professional schools affiliated with Northeastern University.

GRADUATE AND PROFESSIONAL SCHOOLS

ACTUARIAL SCIENCE

Master of Science in Actuarial Science.

ARTS AND SCIENCES

Master of Arts, Master of Science, Doctor of Philosophy.

BUSINESS ADMINISTRATION

Master of Business Administration.

EDUCATION

Master of Education.

ENGINEERING

Master of Science with course specification, including a special six-year program in power systems engineering leading to both bachelor's and master's degrees in Electrical Engineering; a similar six-year program in mechanical engineering leading to both bachelor's and master's degrees; and Doctor of Philosophy degree in the fields of Electrical, Chemical, and Mechanical Engineering.

LAW

Juris Doctor.

PHARMACEUTICAL SCIENCES

Master of Science with specialization in hospital pharmacy, industrial pharmacy, medicinal chemistry, and pharmacology.

PROFESSIONAL ACCOUNTING

A five-quarter curriculum leading to the degree of Master of Science in Accounting.

Some of these programs are offered on the Cooperative Plan; others provide teaching and research fellowships for able candidates. Administrative headquarters for all graduate programs are located in Churchill Hall.

CENTER FOR CONTINUING EDUCATION

The Center for Continuing Education was established to relate the University to the needs of its community in a period of accelerated change. Its programs are composed of seminars, conferences, institutes, forums, and a wide variety of special courses designed to serve specific needs. The Division of Special Programs, working cooperatively with trade associations and professional societies, offers a wide variety of programs dealing with current needs and problems. Through its Division of Community Services, working with governmental agencies and community organizations, the Center is becoming increasingly involved in social problems on both the local and national level.

Many of these programs are conducted at Henderson House, Northeastern University's conference center in Weston, Massachusetts.

AFFILIATED PROGRAMS

FOR DENTAL HYGIENISTS

The Forsyth School for Dental Hygienists conducts a two-year program of dental hygiene education and general education in cooperation with Northeastern University. Graduates of the program receive the Certificate in Dental Hygiene from Forsyth and the degree of Associate in Science from Northeastern.

FOR MEDICAL TECHNOLOGISTS

In cooperation with the New England Baptist and the New England Deaconess Hospitals, Northeastern University offers a full-time day program on the Cooperative Plan leading to the degree of Bachelor of Arts.

FOR NURSES

Northeastern University offers instruction in the sciences, humanities, and social studies for student nurses from the New England Deaconess and Children's Hospital Medical Center Schools of Nursing.

RESEARCH ACTIVITIES

The faculties of the University are engaged in a wide variety of basic research projects in business, science, social science, pharmacy, and engineering. These are coordinated by the Dean of Research, whose services are University-wide and available to the faculties of all the Colleges.

Although Northeastern is primarily concerned with undergraduate and graduate instruction, the University believes that the most effective teaching and learning takes place in an environment characterized by research activities directed toward extending the frontiers of knowledge.



Buildings and Facilities

LOCATION OF MAIN CAMPUS

The main campus of Northeastern University is located at 360 Huntington Avenue in the Back Bay section of Boston. Many of the city's famous cultural, educational, and philanthropic institutions are situated in the Back Bay, including the Museum of Fine Arts, Symphony Hall, Horticultural Hall, the Isabella Stewart Gardner Museum, the Harvard teaching hospitals, and many schools and colleges. Most are within walking distance of Northeastern University.

Major transportation facilities serving the Boston area are Logan International Airport, two rail terminals, bus terminals serving inter- and intrastate lines, and MBTA subway-bus service within the metropolitan-suburban area. There is a subway stop in front of the campus. For motorists, the best routes to the campus are the Massachusetts Turnpike (Exit 22) and Route 9, of which Huntington Avenue is the intown section.

The campus of 47 acres is divided by Huntington Avenue, with the main educational buildings on one side and dormitories on the other. The principal buildings, all of which have been constructed since 1938, are of glazed brick in contemporary classic style. Most are interconnected by underground passageways.

CARL S. ELL STUDENT CENTER

The Carl S. Ell Student Center provides facilities for student recreation and for extracurricular activities. The Alumni Auditorium, with a seating capacity of 1,300, is part of the Center. Also included are special drama facilities, a ballroom, main lounge, fine arts exhibition area, student offices, conference rooms, and a dining area seating more than 1,000.

THE UNIVERSITY LIBRARY

The Dodge Library is the main library on the Boston campus and maintains an open-stack system. Bound volumes in the library system exceed 190,000, and microfilm titles, 250,000. Collections are located in these areas:

1. The General Collection in the book stacks as indicated by the classification number given in the upper left corner of the catalog card.
2. The Reference Collection in the Cabot Reading Room to the left of the Circulation Desk, which includes bibliographies, government documents, maps, company publications, the information file, association publications, and theses.
3. The Periodical Collection on the basement level occupying the lower Reading Room and the first two back-stack levels.
4. The Reserve Book Collection adjacent to the Periodical Room on the basement level.
5. The Foreign Literature Collections in the Webster Reading Room to the right of the Circulation Desk.
6. The Audio-Facility Division consisting of sound recordings and magnetic tapes for instructional and individual use in the Richardson Room on the second floor.
7. The American and English Literature Collections in the new Literature Reading Room.
8. The Humanities Collection (Philosophy, Psychology, Religion) in Rooms 202 and 203.
9. The Microtext Collection housed on the basement level adjacent to the periodical room. This collection includes 300,000 titles in micro-print, microfilm, and microfiche forms.

The Card Catalog is a union list of materials in the University Library and is located in the Webster Reading Room.

The Circulation Department has an IBM card file of all students attending the University. To borrow materials, students should present university identification at the Circulation Desk. For extensive research, where it is not possible for the University Library to acquire materials, the inter-library loan system allows the acquisition of items from other collections throughout the country.

Library Hours (Boston Campus)

Monday — Thursday	7:45 a.m. to 10:00 p.m.
Friday	7:45 a.m. to 7:30 p.m.
Saturday	8:30 a.m. to 4:00 p.m.
Sunday	1:00 p.m. to 10:00 p.m.

The reading rooms on the second floor are open until 1 a.m., Monday-Friday. The library is open Sundays and holidays from 1:00 to 10:00 p.m.

The University Library System includes two libraries in the Division of Research. Physics-Electrical Engineering is housed in 325 Dana Research Center and Chemistry-Mathematics is housed on the fifth floor of the United Realty Building.

SUBURBAN CAMPUS

The Suburban Campus, located near the junction of Routes 128 and 3 in Burlington, Massachusetts, was established to meet the needs of individuals and of industry in the area.

In addition to graduate courses in engineering, physics, mathematics, business administration, science, education, and the arts, portions of undergraduate programs leading to the associate and bachelor's degrees, special programs for adults, and non-credit state-of-the-art programs are offered.

HENDERSON HOUSE

The University's conference center, Henderson House, is located in Weston, Massachusetts. The Center for Continuing Education conducts short-term courses, seminars, and special institutes for business, professional, and research groups. Henderson House is 12 miles from the main campus.

WARREN CENTER

The Warren Center for Physical Education and Recreation in Ashland, Massachusetts, serves as a year-round outdoor laboratory for students in Boston-Bouvé College. There are facilities for conferences, special education in arts and crafts, and sports, including aquatics. Buildings include a lodge, cottages, and an infirmary.

MARINE SCIENCE INSTITUTE

The Marine Science Institute at Nahant, Massachusetts, is a research and instructional facility primarily engaged in studies of marine biology and oceanography. Operated all year, the Institute is about 20 miles northeast of Boston.

GRADUATE SCHOOL



GRADUATE SCHOOLS AND DEGREE PROGRAMS

Graduate School of Actuarial Science

Master of Science in Actuarial Science

Graduate School of Arts and Sciences

Master of Arts Degrees

in the fields of

Economics, English, History, Political Science,
Psychology, and Sociology-Anthropology

Master of Science Degrees

in the fields of

Biology, Chemistry, Health Sciences,
Mathematics, and Physics

Doctor of Philosophy Degrees

in the fields of

Biology, Chemistry, Mathematics,
Physics, Psychology, and Sociology

Graduate School of Business Administration

Master of Business Administration

Graduate School of Education

Master of Education

Graduate School of Engineering

Master of Science Degrees

in the fields of

Chemical, Civil, Electrical, Industrial,
and Mechanical Engineering, and
Engineering Management

Doctor of Philosophy Degrees

in the fields of

Chemical, Electrical, and Mechanical Engineering

Graduate School of Pharmaceutical Sciences

Master of Science in Hospital Pharmacy

Master of Science in Industrial Pharmacy

Master of Science in Medicinal Chemistry

Master of Science in Pharmacology

Graduate School of Professional Accounting

Master of Science in Accounting

General Graduate Division Regulations

REGISTRATION

Students must register in the Graduate Division Office at the times specified by the Graduate School calendar.

RESIDENCE

All work for advanced degrees must be completed in residence at the University unless approval has been obtained from the Dean of the Graduate Division for work taken elsewhere. Students who are in residence and are using the facilities of the University must register for such work.

PROGRAMS OF STUDY

At the time of his first registration, each full-time student must develop, with the assistance of his faculty adviser, a complete program of study for the degree for which he is registered. All subsequent changes must be approved by his faculty adviser.

Evening part-time students will be expected to complete the required courses outlined by each department, after which the elective courses may be undertaken. The study load for such students is limited to a program of two courses per quarter unless special permission to carry a heavier load is given by the director of the graduate school concerned.

GRADING SYSTEM

The performance of students in graduate courses will be recorded by the instructor by use of the following grades:

A. Excellent

This grade is given to those students whose performance in the course has been of very high graduate caliber.

B. Satisfactory

This grade is given to those students whose performance in the course has been at the level necessary for graduate credit.

C. Fair

This grade is used to indicate that the student's performance in the course may be acceptable but is not consistently at the level expected in graduate work.

F. Failure

This grade is used to indicate unsatisfactory work.

In addition, the following letter designations are used:

- I. Incomplete, without quality designation. This is used when a student does not take the final examination or otherwise fails to complete the work of the course.
- S. Satisfactory, without quality designation. This designation may be used for thesis and seminar work.
- W. Withdrawn without prejudice.

The designation "I" will be changed to a grade upon removal of the deficiencies which caused the grade of "I" to be reported. Such deficiencies must be removed within four weeks after the quarter ends, or the grade of "I" will be changed to a grade of "F." If the deficiencies are due to a missed final examination, permission to take a make-up must be obtained from the director of the respective graduate school within one week following the date of the missed examination, and the examination must be made up at the time specified by the Graduate Division.

WITHDRAWALS

In order to withdraw from a course, a student must fill out an official withdrawal form obtained at the Graduate Division Office or at the Burlington Campus Office. Withdrawals may be made through the ninth week of the quarter. Students will be withdrawn as of the date on which they fill out the form. Ceasing to attend a class or notifying the instructor does not constitute an official withdrawal.

Students who do not attend the first two class sessions and who do not notify the Graduate Division of their intention to withdraw will be dropped from the class for nonattendance.

Requests for withdrawal from a course after the ninth week of the quarter may be submitted to the Director of the appropriate Graduate School, and may be approved to avert unusual hardships on a student.

CLASS HOURS AND CREDITS

All credits are entered as quarter hours. A quarter hour of credit is equivalent to three fourths of a semester hour credit. All classes meet on a quarter basis. In the summer session, classes meet for six-week periods. The academic calendar for each graduate school should be consulted in order to determine the opening and closing dates of the sessions.

THE MASTER'S DEGREE

Admission

Specific requirements for each degree program will be found in the appropriate paragraphs for each graduate school or department.

Academic Classifications

Those students who have a bachelor's degree from an accredited program with acceptable quality of undergraduate work are classified as regular students.

Students whose records do not qualify them for enrollment as regular students may be accepted as provisional students. Provisional students must obtain a B average in the first 12 quarter hours of credit work in order to continue in the graduate program; at that time, they may be reclassified as regular students.

Those students who are not pursuing a specific degree program are classified as special students. Special students must satisfy the requirements for admission and perform work of satisfactory level in order to continue as special students.

Any student whose record is not satisfactory may be dropped by action of the graduate school committee for his program.

Academic Requirements

A candidate for the master's degree must satisfactorily complete an approved program conforming to the requirements of the department or graduate school in which he is registered.

The requirements for the master's degree are a minimum of 40 quarter hours of correlated work of graduate caliber, together with such other study as may be required by the department or graduate school concerned.

In order to qualify for any master's degree except that of Master of Science in Professional Accounting, an average grade of B must be obtained in the necessary quarter hour credits required for the degree, excluding any transfer credits. For the degree of Master of Science in Professional Accounting, an average grade of B must be obtained in 60 quarter hour credits and no less than a C for the remainder of the work. At the discretion of the graduate school committee for each of the various degrees, not more than 9 quarter hours of extra courses or repeated courses may be allowed in order to satisfy the grade requirements for a degree. At the discretion of the graduate school committee for each of the various degrees, the committee may limit the number of C grades allowable to satisfy the grade requirements for a degree.

Within the above limitations for extra or repeated courses, a required course for which a grade of F is received must be repeated with a grade of C or better, and may be repeated once. If a grade of F is received

in an elective course, that course may be repeated once to obtain a grade of C or better, or another elective course may be substituted for it. If a grade of C is received in a required course, that course may be repeated once to obtain a grade of B or better.

Comprehensive Examination

At the discretion of the department, a final written or oral comprehensive examination may be required. Such examinations will be given at least two weeks before the commencement at which the degree is expected.

Thesis

If a thesis is required in partial fulfillment of degree requirements, it must show independent work based in part upon original material, and must meet the approval of the respective graduate school committee.

Instructions concerning preparation of the thesis may be obtained from the respective graduate school committee.

Foreign Language Requirement

An examination to show evidence of ability in one or more foreign languages may be required in some graduate programs. This knowledge is established by an examination arranged by the respective graduate school committee.

Transfer Credits

A maximum of 12 quarter hours of graduate credit obtained at another institution may be accepted toward the master's degree provided the grades are A or B. Grades on transfer credits may not be used for the purpose of obtaining the academic average necessary for completion of the degree requirements.

Time Limitations

Course credits earned in the program of graduate study, or accepted by transfer, are valid for a maximum of seven years unless an extension is granted by the respective graduate school committee.

THE DOCTOR OF PHILOSOPHY DEGREE

The Doctor of Philosophy Degree is awarded to candidates who give evidence of high attainment and research ability in their major field. The degree requirements are administered by committees in charge of each degree program. These committees may be departmental graduate committees or committees of the respective graduate schools depending upon the nature of the program. It is the responsibility of the chairman of the committee to certify to the Graduate Division Office the completion of each requirement for each candidate.

Admission

Each degree program has an established admission procedure for students starting their doctoral work at Northeastern University.

Classification and Degree Candidacy

Students taking advanced graduate work are classified as follows:

1. Doctoral Student

Students in this classification have been admitted to a doctoral program.

2. Doctoral Degree Candidate

Students in this classification are doctoral students who have completed 40 quarter hours of acceptable graduate work beyond the bachelor's degree and have passed the qualifying examination.

3. Special Students

This classification is given to students taking advanced graduate work who are not enrolled for a master's degree, and who have not been admitted to a doctoral program.

Residence Requirement

Candidates for the Doctor of Philosophy Degree must spend the equivalent of at least one academic year in residence at the University taking graduate work. The committee of each degree program specifies the method by which the residence requirement is satisfied.

Qualifying Examination

Students must pass a qualifying examination within time limits set by the committee of the degree program. The material covered in the qualifying examination and the level of course work necessary to prepare for the examination are established by the committee for each program.

Comprehensive Examination

Degree programs may require a comprehensive examination during the time in which a student is a degree candidate. The purpose of this examination is to test the knowledge and skills of the student in a particular area and his knowledge of recent research developments in his field.

Course Requirements

The minimum course requirements of 40 quarter hours constitutes the work normally required for a master's degree. The course requirements beyond this are the doctoral course requirements and the amount of such work necessary in each doctoral program is specified by the committee in charge of the doctoral program.

Dissertation

Each doctoral student must complete a dissertation which embodies the results of extended research and makes an original contribution to the field. This work should give evidence of the candidate's ability to carry out independent investigation and interpret in a logical manner the results of the research. The method of approval of the dissertation is established by the committee in charge of the degree program. The original bound copy of the dissertation must be deposited in the library.

Foreign Language

The nature of the foreign language requirement and how this requirement is satisfied is established by the committee in charge of each degree program.

Final Oral Examination

The final oral examination will be taken after completion of all other requirements for the degree. This examination must be held at least two weeks before the commencement at which the degree is to be awarded.

The committee for the final oral examination for the doctoral degree is appointed by the committee in charge of the degree program, and the Dean of the Graduate Division is notified of the time of the examination.

The final oral examination will be on the subject matter of the doctoral dissertation and significant developments in the field of the dissertation. Other fields may be included if recommended by the examining committee.

Transfer Credit

If transfer credit for doctoral course work is desired, approval for such transfer credit must be given by the committee in charge of the degree program.

Time Limitation

After the establishment of degree candidacy, a maximum of five years will be allowed for the completion of the degree requirements. If a student wishes to obtain a time extension, he may, with the approval of the committee of his degree program, petition the Committee on Doctoral Degree Programs of the University Graduate Council for such extension.

Registration

All students must register in the Graduate Division Office for course work or dissertation as approved by their advisers or the departmental registration officer. After the first registration for doctoral work, registration must be continuous unless withdrawal is allowed by the committee in charge of the degree program. Students must be registered

for dissertation during the quarter in which they take the final oral examination.

INTERDISCIPLINARY PROGRAMS

Some graduate students may wish to pursue doctoral programs whose boundaries overlap substantially into two or more departments. In such cases, an interdisciplinary program may be established which corresponds in scope and depth to doctoral standards, but does not agree exactly with the individual departmental regulations. For such possibilities, the following plan is in operation:

Admission

Application for admission to interdisciplinary doctoral study consists of the submission of a carefully thought-out written proposal describing the areas of proposed study and research. The proposal may be a part of the initial application for admission to graduate study at Northeastern University, or it may be submitted by a student already enrolled. It may be directed to a doctoral degree-granting department or to the Dean of the Graduate Division, who directs it to the appropriate department. In either case, admission to interdisciplinary doctoral study requires favorable recommendation by the sponsoring doctoral degree-granting department and approval by authorized representatives of the graduate study committees of the departments appropriate to the disciplines covered by the applicant's proposal. The sponsoring department becomes the registration base of the student.

Formation of Interdisciplinary Committee

A student who has been accepted for interdisciplinary study must obtain the consent of an adviser who will direct his doctoral thesis. This adviser, who may or may not be a member of the registration department, will be chairman of the interdisciplinary committee for this student. A second member will be appointed from the registration department by its chairman. These two members will obtain one or more additional members or request the Dean of the Graduate Division to do so. At least two departments must be represented on the committee and a majority of the committee must come from doctoral degree-granting departments. The chairman of the registration department will notify the Dean of the Graduate Division of the membership of the committee as soon as arrangements are complete.

Duties of Interdisciplinary Committee

A member of the interdisciplinary committee who is also a member of the registration department will serve as the registration officer to approve the course registration for the student. A copy of the approved course registration must also be filed with the other committee members and with the graduate study committee of the registration department.

The interdisciplinary committee will be responsible for the administration of the qualifying examination, language examination, approval of the thesis, and comprehensive examination. This committee must also certify to the registration department the completion of the requirements for the award of the doctoral degree.

The interdisciplinary committee must assure that the program of the student represents standards comparable to those of the registration department and that the program is not so broad that it has inadequate depth in any area.

The program of the student may be reviewed at any time by the Dean of the Graduate Division to determine whether objectives of the program are being met.



Degree Programs
and
Academic Information
Graduate School of Engineering

Master of Science Degrees
in the fields of
Chemical, Civil, Electrical, Industrial, and Mechanical Engineering,
and Engineering Management

Doctor of Philosophy Degrees
in the fields of
Chemical, Electrical, and Mechanical Engineering

GENERAL INFORMATION

The curricula of the degree programs are given under each departmental heading. The descriptions of courses offered by the several departments are given so that prospective students may obtain a view of the course coverage. Preparation courses are indicated when necessary. Not all courses are offered every year, but the course offerings will be arranged in such a manner that students may make continuous progress toward the degree.

The Graduate School of Engineering issues a circular about July 1st which gives the courses for the following academic year and the times at which they meet.

The number of students enrolled in each class will be limited to permit effective teaching at the graduate level, and the University reserves the right to cancel any course.

Applications

All applicants for full-time study should address inquiries to the respective departments or the Graduate School of Engineering. Application forms and reference blanks will be mailed to the applicant. This material, together with the necessary transcript, should be filed as soon after January 15 as possible.

Applicants for part-time study must make an appointment to see a departmental or Graduate School representative. The date of such interviews are announced in the catalogue (see academic calendar) and the circular issued in July.

In some cases, the Graduate Record Examination may be required of the applicants. These examinations are administered by the Educational Testing Service, Princeton, New Jersey. Applicants must make their own arrangements with the Educational Testing Service for taking the examinations.

The part-time students are allowed to take a maximum of two courses per quarter unless permission for a third course is obtained from the department or the Director of the Graduate School of Engineering.

Academic Requirements

The graduate program for each department is described under the departmental headings. The academic requirements are established in accordance with the Graduate Division regulations. The Graduate School of Engineering allows eight quarter hours of credit to be taken in addition to the stated degree requirements in order to repeat failed required courses or to substitute for elective courses to obtain the required B average for completion of degree requirements.

Honorary Societies

Northeastern University has chapters of the Society of the Sigma Xi and of Phi Kappa Phi. Graduate students are eligible for consideration for election to these societies in accordance with the admission requirements of each organization.

Fellowships

The departments of the Graduate School of Engineering have two types of fellowships available. Some departments have teaching assistantships and research fellowships for students enrolled in work leading to the master's degree. The departments which give doctoral degrees also have research fellowships for such students.

Cooperative Programs

All the graduate departments offer full-time programs on the cooperative plan. This plan requires two academic years and a summer. During this time, each student has three twelve-week quarters of academic work and four twelve-week quarters of professional employment. The staff of the Department of Guidance and Placement of the Division of Cooperative Education will arrange for employment of cooperative graduate students. Applicants for this program must file two letters of recommendation and a copy of all prior college work as soon after January 15 as possible. The admissions committee will notify applicants as soon as their material is complete.

In some departments, all of the students start their academic work in the fall quarter and are classed as Division A students. Some departments have one group of students starting their academic work in the fall quarter and one group of students starting their academic work in the winter quarter. In this case, the first group of students is classed as Division A and the second group of students is classed as Division B. The relationship of the first academic quarter for students in the respective divisions and the Fall, Winter, and Spring academic quarters is explained in the following chart:

DIVISION A

Academic Year	First Academic Quarter	Second Academic Quarter
First	Fall Quarter	Spring Quarter
Second	Winter Quarter	— — — —

DIVISION B

Academic Year	First Academic Quarter	Second Academic Quarter
First	Winter Quarter	— — — —
Second	Fall Quarter	Spring Quarter

Assistantships

Some departments have assistantships, called Graduate Cooperative Teaching Assistantships, in which students alternate full-time academic work with full-time work in the department. Some departments also have available Graduate Cooperative Research Assistantships. Applications for fellowships must be filed by March 15, with two letters of recommendation and a transcript of all prior college work. Holders of fellowships must have their course program approved by the chairman of the respective department before the student registers in the Graduate Division Office.

Part-Time Evening Program

Most of the departments offer part-time evening programs in which the admission requirements are the same as for full-time programs. However, the program is established in such a way that students may progress according to their abilities and the time available. The curricula of the part-time evening programs are specified by the departments. All part-time students must register in the Graduate Division Office and present a transcript of undergraduate record at that time.

TUITION AND FEES

Tuition Charges

Tuition for full-time doctoral degree candidates is \$600 per quarter of registration.

Tuition for Master's degree candidates (Cooperative Programs) is \$600 per quarter of registration.

Tuition for Master's degree candidates (Full-time Programs) is \$600 per quarter of registration.

Tuition for Master's degree candidates and special students (Part-time Evening Programs) is \$42.50 per quarter hour of credit.

Tuition Payments

Tuition statements are mailed to students by the Bursar's office and are payable on or before the date specified. Checks should be drawn payable to "Northeastern University."

Registration Fee

All new students are charged a registration fee of \$10 at the time of first billing.

Late Payment Fee

A late payment fee of \$5 is charged all students for failure to pay tuition on the due date unless special arrangements have been approved by the student accounts office.

Make-up Examination Fee

All students given permission to take a make-up of a final examination are charged a fee of \$5.

Student Center Fee

All students on the Huntington Avenue Campus are charged a fee for the services available in the Student Center as follows:

Part-time Students	\$0.75 each quarter
Full-time Students (including Cooperative Students)	\$12.50 each quarter
Teaching Assistants and Research Fellows	\$6.25 each quarter

Graduation Fee

A fee of \$25 covering graduation is required by the University of all candidates for a degree. This fee is payable on or before May 1 of the year in which the student expects to graduate.

Accident and Sickness Insurance

All full-time students, including those on the Cooperative Plan and teaching and tuition assistants, will pay a non-refundable University Health Services fee of \$25 per year. This fee will cover the group Blue Cross-Blue Shield program and the medical services which are provided to students by the University Health Services.

Infirmary Fee

All students except part-time students are assessed an infirmary fee of \$10 per quarter.

Refunds

Tuition refunds will be granted only on the basis of the date appearing on the official withdrawal form filed by the student. Non-attendance does not constitute official withdrawal. Questions regarding refunds should be discussed with the Bursar's Office.

Refunds will be granted in accordance with the following schedule:

Official Withdrawal Filed Within	Amount of Refund	Percentage of Tuition
1st week of quarter		100%
2nd week of quarter		75%
3rd week of quarter		50%
4th week of quarter		25%
5th week of quarter		None

FINANCIAL AID

Northeastern University has available fellowships and assistantships for students who are engaged in graduate work. The Graduate Division will send candidates the proper application blanks upon request.

Teaching Assistantships

Teaching assistantships are available in most of the departments giving graduate work. Holders of such assistantships carry a half-time academic load and devote half time to academic assistance in the departments. The assistantship grant includes a stipend and remission of tuition.

Tuition Fellowships

Some departments have available tuition fellowships which remit tuition up to twelve quarter hours of graduate work per quarter. In return, students will be required to assist in the academic work of the department. These fellowships are normally given to students who are in the first year of graduate work.

Research Fellowships

Research fellowships are available in some departments giving graduate work. Holders of such fellowships carry a half-time academic load and devote half time to academic assistance in the departments. The fellowship grant includes a stipend and remission of tuition.

Doctoral Research Fellowships

In the departments which give work leading to the Ph. D. degree, research fellowships are available for students who have established candidacy for the Ph.D. degree. These fellowships carry remission of tuition, and the stipend is higher than that for the research fellowships.

Graduate Cooperative Teaching Assistantships

Some engineering departments have Graduate Cooperative Teaching Assistantships available for students studying for the master's degree on the Cooperative Plan. Holders of these assistantships alternate periods of academic work with periods of assistance in the department according to the cooperative calendar. Remission of tuition is given in addition to the compensation for the assistantship.

Graduate Cooperative Research Fellowships

Some engineering departments have Graduate Cooperative Research Fellowships available for students studying for the master's degree on the Cooperative Plan. Holders of such fellowships alternate full-time research work with academic work according to the cooperative calendar. Remission of tuition is given in addition to the compensation for the fellowship.



Appointments

Appointments to fellowships and assistantships are ordinarily announced no later than April 15 for the following academic year or summer. Appointments are for a maximum of one year and are not automatically renewed.

Full-Time Duties

Graduate students who hold teaching assistantships and research fellowships, graduate cooperative teaching assistantships, or graduate cooperative research fellowships are expected to devote full time to their studies and the duties of the grant. They may not accept outside employment without the consent of their faculty advisers and the Dean of the Graduate Division.

National Defense Student Loan Program

Under the National Defense Education Act of 1958, a long-term loan program was established to provide financial assistance to students in need of such aid to continue their education. In 1964, this act was amended to permit participation by students carrying at least one half the normal full-time academic workload as determined by the University.

The maximum amount which may be borrowed in one academic year is \$2,500. The total of loans made to a student for all years, including any loans made to him as an undergraduate, may not exceed \$10,000. The actual amount of any award will be determined by the financial position of the student and his family (if applicable) and the availability of funds. Preference is given to outstanding students.

Repayment of these loans begins nine months after the date the borrower ceases to carry, at an institution of higher education, at least one half the normal full-time academic workload as determined by that institution. The repayment period extends ten years from that point and may be further extended by periods for which he is legally entitled to deferment.

Up to 50 per cent of any such loan (plus interest) shall be canceled for services as a full-time teacher in a public or private nonprofit elementary or secondary school and in institutions of higher education at a rate of 10 per cent (plus interest) for each complete academic year of service, or its equivalent. For services in a school district determined to have a high concentration of students from low-income families, the cancellation rate is 15 per cent for each complete year of service; and an additional 50 per cent of any loan (plus interest) may be canceled.

Additional information and appropriate application forms are available through the Graduate Division Office or from the Office of Financial Aid. The application deadline is September 1 for full-time students or one month prior to the start of the quarter for which aid is requested in the case of half-time students.

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B.S., M.S., Northeastern University; Ph.D., University of Connecticut | Lecturer in Engineering |
| Melvin Mark
B.S., M.S., University of Minnesota; Sc.D., Harvard University | Professor of Mechanical Engineering |

- Ronald G. Newburgh Lecturer in Engineering
A.B., Harvard College; Ph.D., Massachusetts Institute of Technology
- Mark M. Nezer Lecturer in Engineering
S.B., Brown University; M.S., Northeastern University
- David D. Nickerson Lecturer in Engineering
A.B., Bates College; M.B.A., Harvard University
- Gerald A. Nordstrom Lecturer in Engineering
B.S., Ohio State University; M.S., Northeastern University
- Welville B. Nowak Professor of Mechanical Engineering
S.B., Ph.D., Massachusetts Institute of Technology
- John J. O'Donnell Lecturer in Engineering
B.S., Northeastern University; Ph.D., Carnegie Institute of Technology
- Stephen J. O'Neil Lecturer in Engineering
B.S., Northeastern University; M.S., Harvard University
- Alex C. Papaioannou Lecturer in Engineering
B.S., Worcester Polytechnic Institute; M.S., Northeastern University
- Don Parker Lecturer in Engineering
B.E.S., Brigham Young University; M.S., Harvard University; Sc.D., Massachusetts Institute of Technology
- Gerald S. Parker Lecturer in Engineering
B.S., Northeastern University; M.S., Harvard University
- Lawrence L. Parker Lecturer in Engineering
B.A., Carleton College; M.A., M.B.A., University of California
- Edward R. Pershe Associate Professor of Civil Engineering
B.S., Ph.D., University of Illinois; M.S., Massachusetts Institute of Technology
- Edward T. Peters Lecturer in Engineering
B.A., DePauw University; B.S., Purdue University; M.S., University of Wisconsin; Sc.D., Massachusetts Institute of Technology
- Thomas E. Phalen, Jr. Associate Professor of Mechanical Engineering
B.S., Northeastern University; M.S., Harvard University
- Vidjut Prakash Lecturer in Engineering
S.B., M.S., Massachusetts Institute of Technology; Ph.D., Harvard University
- C. Andrew Pretzer Assistant Professor of Civil Engineering
B.S.E., M.S., University of Michigan; Ph.D., Massachusetts Institute of Technology
- Harold R. Raemer Professor of Electrical Engineering
and Chairman of the Department
B.S., M.S., Ph.D., Northwestern University
- Francis P. Ragonese Instructor in Chemical Engineering
B.S., Northeastern University; M.S.E., University of Michigan

- Wilfred J. Remillard Professor of Electrical Engineering
B.S., Massachusetts Institute of Technology; M.S., University of Rhode Island; Ph.D., Harvard University
- Charles A. Renton Associate Professor of Electrical Engineering
B.S., London University; Ph.D., Oxford University
- George O. Reynolds Lecturer in Engineering
B.S., M.S., University of New Hampshire
- Howard H. Reynolds Lecturer in Engineering
A.B., Harvard University; Sc.D., Massachusetts Institute of Technology
- Andrew S. Rinde Lecturer in Engineering
B.S., University of Rhode Island; M.S., Northeastern University
- Gilles J. Rivet Lecturer in Engineering
B.S., Michigan College; M.S., Northeastern University
- J. Spencer Rochefort Professor of Electrical Engineering
B.S., Northeastern University; M.S., Massachusetts Institute of Technology
- Fred A. Rosenberg Assistant Professor of Biology
B.A., New York University; Ph.D., Rutgers University
- Walter M. Rowell, Jr. Lecturer in Engineering
B.S., Northeastern University
- Irving Sacks Lecturer in Engineering
B.A., Brooklyn College; M.S., Carnegie Institute of Technology
- Gerald D. Saks Lecturer in Engineering
B.M.E., Cornell University; M.B.A., Boston University
- Sheldon S. Sandler Associate Professor of Electrical Engineering
B.S., Case Institute of Technology; M.S., Yale University; Ph.D., Harvard University
- Martin M. Santa Lecturer in Engineering
B.S., University of Delaware; S.M., Massachusetts Institute of Technology; LL.B., Boston College
- Martin Schetzen Associate Professor of Electrical Engineering
B.E.E., New York University; S.M., Sc.D., Massachusetts Institute of Technology
- John K. Schindler Lecturer in Engineering
S.B., Massachusetts Institute of Technology; M.S., Ph.D., Purdue University
- Walter C. Schwab Associate Professor of Electrical Engineering
S.B., S.M., Ph.D., Massachusetts Institute of Technology
- William J. Schwalm Lecturer in Engineering
B.A., B.S., Rutgers University
- William J. Scott Lecturer in Engineering
B.S., Babson Institute; M.B.A., Northeastern University

John H. Wells	Lecturer in Engineering
B.S., Worcester Polytechnic Institute	
Lih-Jyh Weng	Assistant Professor of Electrical Engineering
B.S., Cheng Kung University; M.S., Ph.D., Northeastern University	
Robert B. Wilcox	Lecturer in Engineering
B.E., Nova Scotia Technical College; M.S., Massachusetts Institute of Technology	
George H. Willett	Lecturer in Engineering
B.S., M.B.A., University of Michigan	
John A. Williams	Assistant Professor of Chemical Engineering
B.S., Ph.D., Case Institute; M.S., University of Michigan	
Joel M. Winett	Lecturer in Engineering
B.S., E.E., Massachusetts Institute of Technology; M.S., Columbia University	
Leslie E. Woods	Lecturer in Engineering
University of Strasbourg	
John M. Woulbroun	Lecturer in Engineering
B.S., M.S., Sc.D., Massachusetts Institute of Technology	
Robert H. Wyman	Lecturer in Engineering
B.S., M.S., Purdue University	
Alvin J. Yorra	Associate Professor of Mechanical Engineering
B.S., Northeastern University; M.S., Massachusetts Institute of Technology	
Howard L. Yudkin	Lecturer in Engineering
B.S., University of Pennsylvania; S.M., Ph.D., Massachusetts Institute of Technology	
Joseph J. Zelinski	Professor of Mechanical Engineering
B.S., Ph.D., Pennsylvania State University	
John Zotos	Associate Professor of Mechanical Engineering
B.S., Northeastern University; M.S., Massachusetts Institute of Technology	
Joel L. Zuckerman	Lecturer in Engineering
B.S., University of Southern California; M.A., Brandeis University	



*Fields
of
Study*

Chemical Engineering

Admission

To be enrolled for graduate work in chemical engineering, applicants must have obtained a Bachelor of Science degree in Chemical Engineering from a recognized institution.

THE MASTER'S DEGREE

Full-Time Program on the Cooperative Plan

Forty quarter hours of academic work are required. This program may be taken on the Cooperative Plan. On this plan, students take academic work in the Fall and Spring quarters of the first year and in the Winter quarter of the second year. The other three quarters of the two academic years and the summer after the first year are available for professional employment.

The sequence of courses on the cooperative plan will normally be taken according to the following pattern:

First Academic Quarter	Credits	Second Academic Quarter	Credits
4.802 Chemical Engineering Mathematics	4	4.823 Transport Phenomena	4
4.806 Optimization Techniques	4	4.811 Chemical Engineering Thermodynamics . . .	4
4.829 Process Dynamics	4	4.991 Thesis	5
4.991 Thesis	2		<hr/> 13
	<hr/> 14		

Third Academic Quarter	Credits
4.890 Chemical Engineering Kinetics	4
4.973 Heat Transfer	4
4.991 Thesis	5
	<hr/> 13

Students may also take the program on a continuous full-time basis to complete the degree requirements in one academic year. The sequence of courses which students take on this plan is established by the chairman of the department.

Electives

With the approval of the chairman of the department, substitutions may be made for some of the prescribed courses by other courses in the department or in other departments which give graduate work.

THE DOCTOR'S DEGREE

The following material outlines the procedure for admission to the doctoral program and the steps necessary to qualify for the Ph.D. degree. For further information applicants should write to the Chairman of the Department of Chemical Engineering.

Admission

Applicants who are enrolled as candidates for the degree of Master of Science in Chemical Engineering at Northeastern University should apply in writing to the Chairman of the Department of Chemical Engineering for admission to the doctoral program. Such application must be made by April first of the year in which they expect to receive the Master's degree. The departmental graduate committee will examine the record of the applicant and decide whether or not he should be allowed to take the qualifying examination.

Applicants who are enrolled for graduate work at other institutions or who have completed the requirements for the Master's degree should write the chairman of the department for an application for an interview. This form, together with transcripts of all undergraduate and graduate work, must be transmitted to the chairman of the departmental graduate committee. The applicant will be notified of an interview time and, after the interview, will be advised if he should make formal application for admission to the doctoral program. Approved applicants must then submit an application for admission as a doctoral candidate and two letters of recommendation not later than April first. The applicant will then be notified of the acceptance of his application and the date of the qualifying examination.

Residence Requirement

The residence requirement is satisfied by one year of full-time graduate work or two consecutive years of part-time graduate work. In the latter case, a detailed time schedule must be approved by the departmental graduate committee in order to give evidence that at least half of the time is being devoted to the requirements of the Graduate School program. In

general, it should be expected that at least two years of full-time work after establishment of degree candidacy will be necessary.

Degree Candidacy

Degree candidacy is established in accordance with the general Graduate Division regulations.

Qualifying Examination

The qualifying examination includes a written and an oral part and is normally given in the spring and the fall. The written examination, in general, will cover the following areas:

1. General Principles in Chemical Engineering Science
2. Thermodynamics and Stoichiometry
3. Mathematical Procedures and Kinetics
4. Specialized Technological Topics (to be announced)

The oral examination will test general comprehension.

A student may take any or all of the examinations in each set, and may repeat a failed examination, only once, at a later offering. The taking and successful completion of all examinations may not extend over a period greater than 13 months. Previously administered examinations will be available to formal applicants.

Comprehensive Examination

During the time in which a student is a candidate for a doctoral degree he may be required to demonstrate by means of a comprehensive examination a subject-matter knowledge satisfactory for the award of the degree.

Course Requirements

The course requirements in addition to the minimum requirement of forty quarter hours of credit for each student will be determined by the departmental graduate committee and the student in consultation with the committee.

Transfer credit will be dealt with on an individual basis by the departmental graduate committee in accordance with the general Graduate Division regulations.

Thesis

An individual may choose his thesis topic and supervisor as soon as he becomes a doctoral student. In most cases selection of topic will be made immediately after the student has established his candidacy for the Ph.D. degree. He will be expected to discuss with the staff their Ph.D. thesis topics offerings. After these discussions, the student shall notify the adviser, the department head, and the chairman of the Departmental Graduate Committee in writing of his choice of thesis topic and adviser. The chairman of the Departmental Graduate Committee after consultation with the thesis adviser shall appoint an appropriate thesis committee.

This committee shall be kept informed of the progress of the thesis and will approve the thesis in its final form.

Foreign Language

The foreign language requirement may be satisfied by a reading knowledge in two languages selected from French, German and Russian. The examinations are administered by the department and consist of translation from current scientific journals or textbooks.

Final Oral Examination

This examination is held in accordance with the general Graduate Division regulations.

DESCRIPTION OF COURSES

All courses carry four quarter hours of credit unless otherwise noted. Seminars and thesis may have varying credits established by the department at the time of registration.

4.801 Advanced Chemical Engineering Calculations

Prep. Bachelor of Science degree in

Chemical Engineering, including Differential Equations

The study of complex material and energy balances is undertaken with the view to apply these to actual plant conditions.

4.802 Chemical Engineering Mathematics

Prep. 10.147 Mathematical

Analysis or equivalent

Formulation and solution of problems involving advanced calculus as they arise in chemical engineering situations. Methods covered will include ordinary differential equations, series solutions, complex variables, Laplace transforms, partial differential equations, and matrix operations. Emphasis will be placed on methods for formulating the problems. It will be assumed that the student has been exposed to some of these topics in appropriate mathematics courses.

(Offered 1968-69, Fall Quarter)

4.804 Optimization I

Prep. Bachelor of Science degree in

Engineering or Science

The mathematical foundations of indirect optimum seeking techniques are developed. Topics covered include necessary and sufficient conditions for maxima and minima, equality and inequality constraints, differential algorithms, geometric and linear programming. The application of these techniques is illustrated with problems of engineering interest.

2 Q.H. credits.

(Offered 1968-69, Fall Quarter, evening only)

4.805 Optimization II

Prep. Bachelor of Science degree in

Engineering or Science

Direct optimum seeking techniques are developed for single and multivariable search problems. Topics covered include Fibonacci search, contour tangent

elimination, gradient methods and dynamic programming.

2 Q.H. credits. (Offered 1968-69, Winter Quarter, evening only)

4.806 Optimization Techniques

Prep. Bachelor of Science Degree
in Engineering or Science

Content same as 4.804 and 4.805.

(Offered 1968-69, Fall Quarter)

4.811 Chemical Engineering Thermodynamics

Prep. Undergraduate
Chemical Engineering Thermodynamics

A thermodynamic analysis of processes of interest to the chemical engineer. Thermodynamics is used as a tool and a method of approach to the solution of industrial problems. Fundamental principles are reviewed to the extent needed. (Offered 1968-69, Fall Quarter)

4.821 Corrosion Fundamentals

Prep. Bachelor of Science Degree

Economic factors, basic theories, types, behaviors of specific systems and protection against corrosion are studied. Wherever possible, engineering applications of the principles are emphasized.

2 Q.H. credits. (Offered 1968-69, Fall Quarter, evening only)

4.823 Transport Phenomena

Prep. Advanced Mathematics and
Unit Operations or equivalent

A consideration of the relationships of mass, momentum, and energy transfer. Fundamental equations of change covering the transport of momentum, heat, and mass are developed to illustrate the essential unity of the transport processes. Molecular, microscopic, and macroscopic systems are studied. It will be seen that much of the theory behind the engineering calculations on which the unit operations of chemical engineering are based can be organized and integrated in terms of equations of change. (Offered 1968-69, Spring Quarter)

4.827 Chemical Process Control

Prep. Bachelor of Science Degree

The Laplace transform. Mathematical modeling of unsteady state heat transfer, liquid level, and chemical reactor systems. Transient response of control systems with emphasis on regulator operation. Stability analysis by various methods. (Offered 1968-69, Fall Quarter, evening only)

2 Q.H. credits.

4.828 Chemical Process Dynamics

Prep. 4.827,

Chemical Process Control

Obtaining frequency response from experimental dynamic data by the methods of harmonic, step, pulse, and random forcing. Distributed parameter systems. Discussion of papers from the literature.

2 Q.H. credits. (Offered 1968-69, Winter Quarter, evening only)

4.829 Chemical Process Dynamics and Control

Prep. Bachelor of Science Degree

Content same as 4.827 and 4.828.

(Offered 1968-69, Fall Quarter)

4.832 Chemical Data Estimation

Prep. Bachelor of Science Degree

Methods of obtaining physical and thermodynamic properties of chemical compounds and systems without resorting to laboratory investigations. Latest empirical relationships and physical and thermodynamic laws are introduced to obtain data for plant design and other chemical and engineering uses.

2 Q.H. credits. (Offered 1968-69, Winter Quarter, evening only)

4.890 Chemical Engineering Kinetics Prep. Thermodynamics, undergraduate Chemical Engineering Kinetics or equivalent
A review of the principles of reaction kinetics. Problems for solution similar to those encountered in the design and operation of reaction equipment are selected to illustrate important principles. (Offered 1968-69, Winter Quarter)

4.899 Special Topics in Chemical Engineering Prep. Permission of Department staff
Topics of interest to the staff member conducting this class are presented for advanced study. A student may not take more than one Special Topics course with any one instructor. (Offered 1968-69, all quarters)

4.973 Heat Transfer Prep. Undergraduate Heat Transfer
Discussion of the three mechanisms of heat transfer. Conduction in stationary systems. Free and forced convection in laminar and turbulent flow. Boiling and condensation. Heat exchangers. Radiant heat Transfer. (Offered 1968-69, Winter Quarter)

4.990 Seminar Prep. Admission to graduate program in Chemical Engineering
Topics of an advanced nature are presented by staff, outside speakers and students in the graduate program. This course must be attended by all master's degree candidates. (Offered yearly, all quarters)

4.991 Thesis (Master's Degree) Prep. Admission to Master of Science Program in Chemical Engineering
Analytical and/or experimental work conducted under the supervision of the department. For master's degree requirement. (Offered yearly, all quarters)

4.995 Thesis (Ph.D. Degree) Prep. Admission to Doctoral Program in Chemical Engineering
Theoretical and experimental work conducted under the supervision of the department. (Offered yearly, all quarters)

Civil Engineering

Admission

To be enrolled for graduate work leading to the degree of Master of Science in Civil Engineering, applicants must have obtained a Bachelor of Science degree in Civil Engineering from a recognized institution. Applicants with a Bachelor of Science degree from a recognized institution in some other engineering field or related science and an appropriate background of preparation may pursue this program and qualify for the degree of Master of Science without specification.

THE MASTER'S DEGREE

Full-Time Program on the Cooperative Plan

Forty quarter hours of academic work are required. This program may be taken on the Cooperative Plan. On this plan students take academic work in the Fall and Spring quarters of the first year and in the Winter quarter of the second year. The other three quarters of the two academic years and the Summer after the first year are available for professional employment.

A thesis carrying eight (8) hours of credit is encouraged and may be elected with the approval of the department. In lieu of a thesis, special reports may be arranged with credit of two (2) quarter hours. Ordinarily, a thesis or report is required.

Options in Structural Engineering and Sanitary Engineering are available. The sequence of courses on the Cooperative Plan will normally be taken according to the following pattern:

STRUCTURAL ENGINEERING

First Academic Quarter	Credits	Second Academic Quarter	Credits
1.847 Structural Analysis .	4	1.856 Structural Analysis .	4
1.877 Eng. Props. of Soils .	4	1.858 Concrete Structures .	4
1.894 Numerical Methods in Structural		1.861 Design of Structures.	2
Mechanics	4	1.878 Foundation Eng.	4
10.804 Advanced Math	2	*1.898 Special Topics	2
		*1.899 Thesis	4
	14		(minimum) 14

*By arrangement with the department in lieu of equivalent required course credits.

Third Academic Quarter	Credits
1.855 Concrete Structures .	2
1.857 Structural Dynamics .	4
1.864 Design of Structures .	4
1.873 Soils Testing Lab. . .	2
*1.898 Special Topics	2
*1.899 Thesis	4
	<hr/>
(minimum)	12

Students may also take this program on a continuous full-time basis to complete the requirements in one academic year.

Substitutions

With the approval of the chairman of the department, substitutions may be made for some of the prescribed courses by other courses in the department or in other departments which offer graduate work.

SANITARY ENGINEERING

First Academic Quarter	Credits	Second Academic Quarter	Credits
1.914 Water & Waste Treatment	4	1.912 Water & Waste Treatment	2
1.923 Sanitary Chemistry . .	4	1.992 Special Topics	2
1.933 Sanitary Analysis . . .	4	Electives	10
Electives	2		<hr/>
	14		14

Third Academic Quarter	Credits
1.922 Sanitary Bacteriology .	2
1.992 Special Topics	2
1.994 Seminar	2
Electives	6
	<hr/>
	12

Students may also take this program on a continuous full-time basis to complete the requirements in one academic year.

Electives

The electives will normally be available according to the following schedule. Approved additional electives may be available from the graduate offerings in the departments of Chemistry, Biology, Chemical Engineering, and Industrial Engineering.

*By arrangement with the department in lieu of equivalent required course credits.

FALL QUARTER

*1.905 Water Resources ..	2
**1.940 Public Health	2
*1.960 Hydr. Strucs.	2

SPRING QUARTER

1.913 Ind. Waste	2
*1.922 Sanit. Bact.	2
1.938 Sanit. Anal.	4
*1.953 Sanit. Micro.	2
1.954 Stream Sanit.	2
*1.962 Hydr. Strucs.	2
1.996 Sem.-Env. Health ...	2

WINTER QUARTER

1.904 Hydraulics	4
1.907 Water Resources ...	2
*1.951 Rad. Health	2
1.952 Ind. Hygiene	2
1.956 Air Resources	4
*1.961 Hydr. Strucs.	2
1.994 Sem.-Env. Eng.	2

PART-TIME EVENING PROGRAMS

The admission requirements for these programs are the same as for the full-time program, but students may progress according to their ability to combine their study load with their employment load.

REQUIRED COURSES

Structural Engineering	Credits	Sanitary Engineering	Credits
1.841 Struc. Analysis	2	1.910 Water & Waste	
1.842 Struc. Analysis	2	Treat.	2
1.843 Struc. Analysis	2	1.911 Water & Waste	
10.804 Adv. Mathematics ..	2	Treat.	2
	<hr/> 8	1.912 Water & Waste	
		Treat.	2
		1.920 Sanit. Chemistry I. .	2
		1.921 Sanit. Chemistry II. .	2
		1.922 Sanitary Bacteriology	2
		1.930 Sanit. Analysis	2
		1.931 Sanit. Analysis	2
			<hr/> 16

Electives

Students in the Structural Engineering option must elect 26 quarter hours from Civil Engineering courses within the Structural Engineering field. Students in the Sanitary Engineering option must elect 18 quarter hours from Civil Engineering courses within the Sanitary Engineering field.

*Offered in evening program only

**Offered in both day and evening program

Six quarter hours may be elected from any courses in engineering or science for which the student has the necessary preparation.

A meaningful sequence of electives must be chosen which meets the approval of the department. Department interviews are necessary early in the program for both day and evening students in order that an approved program of electives may be arranged with the individual. For evening students it is suggested that only required courses be taken during the first quarter. During that quarter an interview should be scheduled within the department for preliminary planning of the remainder of the individual program.

Full Time Program

For those whose programs would be better served by full-time study, the prescribed courses may be taken in one academic year. The sequence of the required courses will be slightly different from the Cooperative Plan.

DESCRIPTION OF COURSES

All courses carry two quarter hours of credit unless otherwise noted.

1.841 Structural Analysis I Prep. Differential and Integral Calculus
plus Theory of Structures
Review of basic principles of structural analysis, determinacy, indeterminacy, stability. Introduction to energy methods and virtual work. Application of energy methods to equilibrium problems. (Offered yearly, Fall Quarter)

1.842 Structural Analysis II Prep. 1.841, Structural Analysis I
A complete treatment of moment distribution including non-prismatic members, axial load, and shear distribution. Introduction to plastic analysis and approximate methods of analysis. (Offered yearly, Winter Quarter)

1.843 Structural Analysis III Prep. 1.842, Structural Analysis II
Introduction to matrix methods of structural analysis including stiffness and flexibility methods. (Offered yearly, Spring Quarter)

1.844 Structural Analysis IV Prep. 1.843, Structural Analysis III
Introduction to advanced structural mechanics including plane stress, plane strain, torsion on non-circular sections and development of finite element method of analysis. (Offered biennially starting in 1969-70, Fall Quarter)

1.845 Structural Analysis V Prep. 1.844, Structural Analysis IV
Matrix methods of structural analysis are applied to discrete element idealizations of dams, plates, shells, folded plates and shear walls. (Offered biennially starting in 1969-70, Winter Quarter)

1.846 Structural Analysis VI Prep. 1.845, Structural Analysis V
Matrix methods are applied to guyed towers, cable structures, and suspension bridges. (Offered biennially starting in 1969-70, Spring Quarter)

1.847 Structural Analysis

Prep. Differential and
Integral Calculus plus Theory of Structures

This course, offered to day students, embodies the material in 1.841 and 1.842, Structural Analysis I and II.

4 Q.H. credits.

(Offered yearly, Fall Quarter)

1.849 Model Analysis

Prep. Admission to Program and
Approval of Instructor

Development of the principles of similitude to establish the relationship between behavior in the model and the full sized structure. Review of techniques to fabricate, to load and to instrument models. Application and use of strain gauges. The laboratory portion is devoted to model analysis of a complex structure.

(Offered biennially starting in 1969-70, Spring Quarter)

1.850 Structural Dynamics I

Prep. 1.843, Structural Analysis III

Analysis of structures subjected to dynamic loads by exact and approximate methods.

(Offered biennially starting in 1968-69, Fall Quarter)

1.851 Structural Dynamics II

Prep. 1.850, Structural Dynamics I

Continuation of 1.850 with application to the design of structures subjected to blast loads and seismic loadings. Other applications will include self-induced vibrations and moving loads on structures.

(Offered biennially starting in 1968-69, Winter Quarter)

1.853 Concrete Structures

Prep. Reinforced Concrete Design

Behavior of concrete under stress and strain. Analysis of modes of failures of concrete members in laboratory tests. A survey of failures of structures resulting from inadequate design and from major causes (earthquakes, accidents, fatigue). Lessons to be learned leading to the derivation for a "Force-Strain Theory" for the analysis of structural systems. Combining the basic analysis of all reinforced concrete, pre-stressed concrete (normal reinforced concrete with normal forces); two dimensional systems (plates, deep girders, walls); three dimensional structures (developable and non-developable surfaces) into a single "Force-Strain Theory" analysis.

(Offered yearly, Fall Quarter)

1.854 Concrete Structures

Prep. 1.853, Concrete Structures

Application of "Force-Strain Theory" to progressive design methods for continuous members (beams, girders, bridges), rigid frames (plant and utility structures, high rise office and apartment buildings and bridges). Analysis of three dimensional rigid frames for single and multi-story structures. Corresponding construction details, practical aspects of field operations connected with a particular design, and evaluation of materials most suitable structurally and economically to be used (strength and type of concrete, type of steel, normal reinforcing or prestressing).

(Offered yearly, Winter Quarter)

1.855 Concrete Structures

Prep. 1.854, Concrete Structures

Design of two dimensional bearing surfaces (plates, deep girders, walls), three dimensional systems (folded plates, shells of developable and non-developable surfaces). Analysis and design of tension and compression systems and derivation of structural systems based on principles of above analysis (hanging roof, suspension bridges and structures, use of compression rings, etc.). Future trends in design and analysis of concrete structures.

(Offered yearly, Spring Quarter)

1.856 Structural Analysis

Prep. 1.847, Structural Analysis

This course, offered to day students, embodies the course content offered in 1.843, Structural Analysis III and 1.844, Structural Analysis IV.

4 Q.H. credits.

(Offered yearly, Spring Quarter)

1.857 Structural Dynamics

Prep. 1.856, Structural Analysis

This course, offered to day students, embodies the material in 1.850 and 1.851, Structural Dynamics I and II.

4 Q.H. credits.

(Offered yearly, Winter Quarter)

1.858 Concrete Structures

Prep. Reinforced Concrete Design

This course, offered to day students, embodies the material in 1.853 and 1.854, Concrete Structures.

4 Q.H. credits.

(Offered yearly, Spring Quarter)

1.859 Structural Stability

Prep. 1.843 Structural Analysis III

Elastic and inelastic stability of structures including beams, columns, plates, and shells.

(Offered biennially starting in 1968-69, Spring Quarter)

1.861 Design of Structures

Prep. 1.842, Structural Analysis I

An advanced course in elastic design in structural steel. Design problems involving braced and rigid frame structures subject to gravity, wind and seismic loads are considered.

(Offered yearly, Fall Quarter, evenings)

(Offered yearly, Spring Quarter, days)

1.862 Design of Structures

Prep. 1.861, Design of Structures

An analysis and design course in structural steel in which the emphasis is on plastic behavior. Design problems involving plastic hinge location in frames and the design of rigid frames using AISC Specs, Section 2, are among the topics considered.

(Offered yearly, Winter Quarter)

1.863 Design of Structures

Prep. 1.862, Design of Structures

Advanced problems in elastic and plastic design of structural steel. Use of high strength steels in building frames. A design project chosen by the student, with approval of the instructor, will be completed in this term.

(Offered yearly, Spring Quarter)

1.864 Design of Structures.

Prep. 1.861, Design of Structures

This course, offered to day students, embodies the material in 1.862 and 1.863, Design of Structures.

4 Q.H. credits.

(Offered yearly, Winter Quarter)

1.871 Engineering Properties of Soils

Prep. Undergraduate course
in basic Soil Mechanics

Review of phase relationships, soil consistency, etc.; permeability and capillarity; effective stress concept, analysis of seepage in porous media; stress distribution; introduction to settlement analysis.

(Offered yearly, Fall Quarter)

1.872 Engineering Properties of Soils

Prep. 1.871, Engineering
Properties of Soils

A continuation of course 1.871. The course covers consolidation theory and settlement analysis; shear strength properties of soils; stability analysis of open and braced cuts, and earth pressure theory and analysis.

(Offered yearly, Winter Quarter)

1.873 Soils Testing Laboratory

Prep. 1.871, Engineering Properties of Soils

Classification tests are performed in conjunction with laboratory studies in compaction, permeability, consolidation and shear strength characteristics of fine and coarse grain soils. CBR and field density tests are also conducted.

(Offered yearly, Spring Quarter)

1.874 Soil Mechanics and Foundation Engineering

Prep. 1.872, Engineering Properties of Soils

Review of important characteristics of granular and cohesive soils with respect to relative density and strength. Bearing capacity of soils — design of isolated and combined footings, raft and mat foundations. Deep foundations — caissons and piles. Load tests of above foundations, and interpretation of results. Practical aspects of foundations work in view of field conditions and economy.

(Offered yearly, Fall Quarter)

1.875 Soil Mechanics and Foundation Engineering

Prep. 1.874, Soil Mechanics and Foundation Engineering

Stress and strain in soils. Principal stress relations in soil — pressure distribution theory — their limits and practical approach — Boussinesq's-Westergaard's-Froelich's-Newmark's methods. Settlement calculations — based on laboratory test results and approximate methods — Time settlement relationship. Lateral earth pressure — design of retaining structures, such as crib walls, retaining walls, and bulkheads. Stability of slopes.

(Offered yearly, Winter Quarter)

1.876 Soil Mechanics and Foundation Engineering

Prep. 1.875, Soil Mechanics and Foundation Engineering

Special topics in foundation engineering. Marine structures (piers, wharves, dolphins, off-shore structures) — cofferdams, vibroflotation, and stabilization of soils for foundations by use of chemicals and other means.

(Offered yearly, Spring Quarter)

1.877 Engineering Properties of Soils

Prep. Undergraduate Course in basic Soil Mechanics

This course, offered to day students, embodies the material in 1.871 and 1.872, Engineering Properties of Soils.

4 Q.H. credits.

(Offered yearly, Fall Quarter)

1.878 Foundation Engineering

Prep. 1.877, Engineering Properties of Soils

This course, offered to day students, embodies the course content offered in 1.874 and 1.875, Soil Mechanics and Foundation Engineering

4 Q.H. credits.

(Offered yearly, Spring Quarter)

1.880 Rheological Properties of Materials

Prep. Consent of Instructor

An introduction to fundamental concepts of stress, strain, and strain rate as applied to engineering materials exhibiting the viscollastic phenomena of creep and stress relaxation. Investigations of physical mechanisms responsible for such behavior.

(Offered yearly, Winter Quarter)

1.892 Numerical Methods in Structural Mechanics

Prep. 1.843, Structural Analysis III

Formulation and numerical solution of Civil Engineering problems in structural mechanics. Emphasis will be on lumped parameter systems. Equilibrium,

eigenvalue, and propagation type problems will be covered. The CDC 3300 will be used.
(Offered biennially starting in 1969-70, Fall Quarter)

1.893 Numerical Methods in Structural Mechanics Prep. 1.892, Numerical Methods in Structural Mechanics
Continuation of 1.892. (Offered biennially starting in 1969-70, Winter Quarter)

1.894 Numerical Methods in Structural Mechanics
Offered to day students and covers topics contained in 1.892 and 1.893.
4 Q.H. credits. (Offered yearly, Fall Quarter)

1.898 Special Topics in Structural Engineering Prep. Admission to Engineering Graduate School
An individual effort in an area selected by student and adviser resulting in a definitive report. Open to day students only.
2 Q.H. credits. (Offered yearly, all quarters)

1.899 Thesis (Master's Degree) Prep. Permission of the Department
Analytical and/or experimental work conducted by arrangement with and under supervision of the department.
8 Q.H. credits. (Offered yearly, all quarters)

1.901 Hydraulics Prep. Undergraduate course in Hydraulics
Mechanical properties of fluids, continuity, Euler and Bernoulli equations, linear and angular momentum, forced acceleration, general energy equation, steady flow in conduits under pressure, compound pipe systems and networks.
(Offered yearly, Fall Quarter)

1.902 Hydraulics Prep. 1.901, Hydraulics
Velocity potential function and stream function; flow nets; dimensional analysis; skin friction, drag and lift, introduction to boundary layer theory; cavitation; water hammer.
(Offered yearly, Winter Quarter)

1.903 Hydraulics Prep. 1.902, Hydraulics
Open channel flow-uniform flow, local phenomena, surface curves, integration of varied flow function; hydraulic design of spillways, spilling basins, and transitions; hydraulic models.
(Offered yearly, Spring Quarter)

1.904 Hydraulics Prep. Undergraduate course in Hydraulics
This course offered to day students, embodies substantially the material in 1.902 and 1.903, Hydraulics.
4 Q.H. credits. (Offered yearly, Winter Quarter)

1.905 Water Resources Planning I Prep. Admission to Engineering Graduate School
Meteorological principles. Hydrologic cycle. Statistical and other analysis of precipitation and runoff. Precipitation studies cover adjustment of data; areal distribution; probable maximum precipitation; depth-area-duration, intensity-duration, rainfall frequency relationships. Runoff studies cover adjustment of data; peak flows; rainfall-runoff relationships; drainage basin characteristics; streamflow characteristics; unit hydrographs.
(Offered yearly, Fall Quarter)

1.906 Water Resources Planning II

Prep. 1.905, Water
Resources Planning I

Reservoir flood routing. Drainage design. Mass curve analyses. Reservoir operation. Duration curves. Ground water hydrology. Studies of erosion, sedimentation, temperature, and snow melt.
(Offered yearly, Winter Quarter)

1.907 Water Resources Planning III

Prep. 1.906, Water
Resources Planning II

Applications of statistics, mathematical models, and high-speed computers to hydrologic analyses and other water resources planning problems; legal aspects of water utilization and control; multiple-purpose and multiple-unit systems; benefit-cost analyses; technical and economic feasibility studies.
(Offered yearly, Spring Quarter)

1.910 Water and Waste Treatment

Prep. Admission to Engineering
Graduate School

Water usage, water quality, the theory and practice of water treatment, and the basic design of water supply and treatment works are presented including intake facilities, wells, filtration, coagulation, sedimentation, softening, iron and manganese removal, disinfection and fluoridation. (Offered yearly, Fall Quarter)

1.911 Water and Waste Treatment

Prep. 1.910, Water and
Waste Treatment

The theory and practice of sewage treatment and disposal; the basic design of primary and secondary treatment works, including screening, grit removal, sedimentation, biological stabilization processes, sludge digestion, waste stabilization ponds and disinfection. Advanced waste treatment methodology is also discussed.
(Offered yearly, Winter Quarter)

1.912 Water and Waste Treatment

Prep. 1.911, Water and
Waste Treatment

Special applications in water and waste treatment including corrosion control, disinfection, pumping and storage facilities, application of chemicals, and salt water conversion. Emergency installations for both water supply and waste disposal. Instrumentation and automatic controls.
(Offered yearly, Spring Quarter)

1.913 Industrial Waste Disposal

Prep. 1.921, Sanitary Chemistry II

A study of various manufacturing processes and their waste problems, together with methods of utilization, treatment, and disposal of their waste products. Specific processes that can be adapted to specific waste and their necessary concomitant structures are studied with the viewpoint of designing suitable treatment plants.
(Offered 1968-69, Fall Quarter, evenings)

(Offered yearly, Spring Quarter, days)

1.914 Water and Waste Treatment

Prep. Two undergraduate
semesters of Hydraulics

This course, offered to day students, embodies the material in 1.910 and 1.911, Water and Waste Treatment.

4 Q.H. credits.

(Offered yearly, Fall Quarter)

1.920 Sanitary Chemistry I

Prep. Two semesters of
General Chemistry

Analytical chemistry principles are studied with reference to sanitary engineering applications. The chemistry of processes such as coagulation, iron and manganese removal, ion exchange, softening and disinfection are included. The principles of spectroscopy and polarography are also discussed.

(Offered yearly, Fall Quarter)

1.921 Sanitary Chemistry II

Prep. 1.920, Sanitary Chemistry I

A continuation of 1.920 including gas transfer, oxidation and reduction, and radiation chemistry. Reaction rates with reference to sanitary engineering applications such as BOD are discussed. Topics in organic chemistry and instrumental analysis are included.

(Offered yearly, Winter Quarter)

1.922 Sanitary Bacteriology

Prep. 1.921, Sanitary Chemistry II

A study of bacteriology with emphasis on sanitary engineering applications. The course includes cell structure, nutrition, morphology, growth, reproduction and metabolism of bacteria. Effects of environmental factors including inhibition, killing and natural habitats are discussed. Methods of quantitative bacteriology are also covered.

(Offered yearly, Spring Quarter)

1.923 Sanitary Chemistry

Prep. Two semesters of General Chemistry

Offered to day students and covers the topics contained in 1.920, Sanitary Chemistry I and 1.921, Sanitary Chemistry II.

4 Q.H. credits.

(Offered yearly, Fall Quarter)

1.930 Sanitary Analysis

Prep. 1.921, Sanitary Chemistry II

A laboratory course in which routine analyses of water, sewage and industrial wastes are performed. Samples are analyzed qualitatively and quantitatively for physical and chemical properties. Laboratory analysis is performed in conjunction with various unit operations of water and sewage treatment such as iron and manganese removal, coagulation and sedimentation, water softening, disinfection, odor and color removal, and corrosion control. Standard methods of the American Public Health Association, along with other up-to-date methods of analysis utilizing colorimetry and spectrophotometry are employed. Interpretation of results in sanitary reports is emphasized.

(Offered yearly, Winter Quarter)

NOTE: It is strongly recommended that this course and 1.931 be taken simultaneously with 1.921 and 1.922.

1.931 Sanitary Analysis

Prep. 1.930, Sanitary Analysis

The laboratory analyses of water, sewage and industrial wastes are continued. Investigation is made of biological waste treatment methods, including both chemical and biological analysis. Fresh water algae and other organisms are observed by microscopy. Bacteriological analyses, including membrane filter technique, are performed. Emphasis on sanitary reports is continued.

(Offered yearly, Spring Quarter)

1.933 Sanitary Analysis

Prep. 1.923, Sanitary Chemistry
taken simultaneously

This course, offered to day students, embodies the material in 1.930 and 1.931, Sanitary Analysis.

4 Q.H. credits.

(Offered yearly, Fall Quarter)

1.935 Sanitary Laboratory — Unit Operations

Prep. 1.931,
Sanitary Analysis

Laboratory-scale unit operations and processes in water and waste treatment are developed. Coagulation and sedimentation, filtration, softening, taste and odor control, disinfection, iron and manganese removal, and corrosion control are included. Reports are required selecting best suited treatment processes.

(Offered 1969–70, Winter Quarter)

1.936 Sanitary Laboratory — Unit Operations

Prep. 1.935,
Sanitary Laboratory — Unit Operations

Laboratory-scale unit operations and processes in water and waste treatment are continued. Activated sludge, trickling filter, photosynthetic processes, vacuum filtration, sludge digestion, gas utilization and production are considered. Reports selecting treatment processes continue to be emphasized.

(Offered 1969–70, Spring Quarter)

1.938 Sanitary Analysis

Prep. 1.933, Sanitary Analysis

This course, offered to day students, embodies the material in 1.935 and 1.936, Sanitary Laboratory.

4 Q.H. credits.

(Offered yearly, Spring Quarter)

1.940 Public Health Engineering Survey

Prep. Admission to
Engineering Graduate School

An historical survey of public health conditions is used to introduce the student to the modern approach to public health engineering problems. Applications of engineering principles to such problems as garbage and refuse disposal, control of insect-borne diseases, milk and food sanitation, rodent control, camp and recreational sanitation, housing, control of atmospheric pollution, and radiological health are considered. (Offered yearly, Fall Quarter, day and evening)

1.950 Air Pollution

Prep. Admission to Engineering Graduate School

Theory and practice related to engineering management of air resources, control of gaseous emission, investigation and study of air pollution, sampling and analysis methods.

(Offered 1968–69, Fall Quarter)

1.951 Radiological Health Engineering

Prep. Admission to
Engineering Graduate School

Types and sources of radioactive wastes, methods of handling, storage, and disposition of solid, liquid and gaseous radioactive wastes. Regulatory agency requirements.

(Offered yearly, Winter Quarter)

1.952 Industrial Hygiene

Prep. Admission to
Engineering Graduate School

Factors in the industrial environment that adversely affect the health, comfort and efficiency of the worker. Industrial surveys, and application of engineering principles to control of dust, toxic metals, gases and vapors, organic compounds, radiation, pressure, temperature and humidity.

(Offered 1968–69, Winter Quarter)

1.953 Sanitary Microbiology Prep. 1.922, Sanitary Bacteriology
An advanced course in microbiology studying microorganisms found in water, soil, milk, and food, including fresh water algae. Applied microbiology is discussed concerning taste and odor organisms, trickling filters, activated sludge, digesters, lagoons and composting. (Offered yearly, Spring Quarter)

1.954 Stream Sanitation Prep. 1.920, Sanitary Chemistry I
The basic principles of stream sanitation and corrective control methods. The topics taken up in this course include the following: aerobic and anaerobic decomposition, oxygen balance, carbon dioxide, oxidation, reduction, bacterial pollution, industrial pollution, water supply, shellfish, fish life, riparian rights, recreation and general stream sanitation. (Offered yearly, Fall Quarter)

1.955 Air Sampling and Analysis Prep. 1.950 Air Pollution
A laboratory course on air pollution measurements utilizing physical, chemical and instrumental methods and calibration and use of sampling equipment for gaseous and particulate pollutants. Identification and quantitative measurements of pollutants are performed utilizing microscopy, Spectrophotometry, gas chromatography and atomic absorption spectroscopy. (Offered 1968-69, Winter Quarter)

1.956 Air Pollution Engineering Prep. Admission to Engineering Graduate School
This course offered to day students embodies the material of 1.950, Air Pollution and 1.955, Air Sampling and Analysis. 4 Q.H. credits. (Offered yearly, Winter Quarter)

1.960 Hydraulic Structures I Prep. Undergraduate Course in Hydraulics
Dams and associated structures. Design criteria and preliminary analyses for gravity, arch, buttress, rock-fill and earth-fill dams. Foundation treatment and scour protection. Spillway structures. Gates. Navigation requirements of large rivers. Fishways. (Offered 1968-69, Fall Quarter)

1.961 Hydraulic Structures II Prep. Undergraduate Course in Hydraulics
Intake structures in reservoirs and on rivers. Tunnels and pipe lines: design criteria and structural analyses; economic studies for diameter selection. Penstocks and anchor blocks. Canals: seepage and erosion; linings; canal structures. (Offered 1968-69, Winter Quarter)

1.962 Hydraulic Structures III Prep. Undergraduate Course in Hydraulics
Surge tanks; selection of type. River regulation; design principles; flood protection and navigation requirements; bank revetments, groins, dikes, and levees. Cofferdams. Operation and maintenance of hydraulic structures. (Offered 1968-69, Spring Quarter)

1.991 Thesis (Master's Degree) Prep. Permission of the Civil Engineering Department
Analytical and/or experimental work conducted by arrangement with and under the supervision of the department. 8 Q.H. credits. (Offered yearly, all quarters)

1.992 Special Topics in Sanitary Engineering

Prep. Admission to
Engineering Graduate School

An individual effort in an area selected by student and adviser resulting in a definitive report.

2 Q.H. credits.

(Offered yearly, all quarters)

1.994 Seminar — Environmental Engineering

Prep. Admission to
Engineering Graduate School

Discussions by professional engineers and scientists, faculty and graduate students on subjects within the area of Environmental Engineering. Open to day students only.

(Offered yearly, Winter Quarter)

1.996 Seminar — Environmental Health

Prep. Admission to
Engineering Graduate School

Discussion by professional people in the Public Health field, faculty and graduate students on subjects within the area of Environmental Health. Open to day students only.

(Offered yearly, Spring Quarter)

Electrical Engineering

Admission

To be enrolled for graduate work leading to the degree of Master of Science in Electrical Engineering, applicants must have obtained a Bachelor of Science degree in Electrical Engineering from a recognized institution. Applicants with a bachelor's degree in other engineering or related science fields and an appropriate background of preparation may pursue this program and qualify for the degree of Master of Science without specification.

THE MASTER'S DEGREE

Full-Time Program on the Cooperative Plan

Forty quarter hours of academic work are required. This program may be taken on the Cooperative Plan. On this plan one group of students takes academic work in the Fall and Spring quarters of the first year and in the Winter quarter of the second year. Another group may take the academic work in the Winter quarter of the first year and in the Fall and Spring quarters of the second year. In either case, the other three quarters of the two academic years and the Summer after the first year are available for professional employment.

The sequence of courses on the Cooperative Plan will normally be taken according to the following pattern:

First Academic Quarter	Credits	Second Academic Quarter	Credits
3.827 Transients in Linear Systems	4	3.832 Linear Circuit Theory I	4
3.842 Linear Active Circuits	4	3.990 Seminar I	2
10.806 Advanced Mathe- matics	4	10.831 Probability	2
Elective	2 or 4	Elective	4 or 6
	14 or 16		12 or 14

Third Academic Quarter		Credits
3.877	Electro-magnetic Theory	4
3.991	Seminar II	2
	Elective	8 or 10
		<hr/> 14 or 16

A limited amount of work may be elected from the evening part-time program.

A thesis for six quarter hours credit is elective with the approval of the chairman of the department. If the thesis option is approved, this work is done in the second year of the program. Details concerning thesis proposals, editorial format, and time schedules are available at the Graduate Division Office.

The program of each student will be made up from the required and elective courses available in each term and approved by the student's academic adviser.

Electives

The electives will normally be available according to the following schedule:

Fall Quarter

- 3.902 Communication Theory — Introduction
- 3.959 Control Systems I (Analysis and Synthesis)
- 3.972 Design Principles of Electronic Digital Computers

Winter Quarter

- 3.803 Applied Electron and Ion Physics
- 3.838 Nonlinear Circuit Analysis I
- 3.852 Theory of Semi-Conductor Devices
- 3.909 Communication Theory — Detection

Spring Quarter

- 3.839 Nonlinear Circuit Analysis II
- 3.905 Communication Theory — Information Theory and Coding
- 3.962 Control Systems II (Non-Linear and Stochastic Systems)

(Additional electives will be available from the later-afternoon portion of the evening program in all quarters.)

Full-Time Program

For those students whose programs would be better served by full-time study the prescribed courses may be taken in one academic year. The sequence of the required courses will be different from the full-time program on the cooperative plan.

POWER SYSTEMS OPTION**Full-Time Program on the Cooperative Plan**

The integrated six-year program for students enrolled in the Power Systems Engineering curriculum culminates in a graduate year on the cooperative plan. Under this arrangement all students are combined into one division and take academic work during the Fall and Spring quarters while engaged in cooperative work during the Summer and Winter quarters.

Forty quarter hours of academic work are required. Those students who have completed five years of the integrated undergraduate program have earned six quarter hour credits of graduate work prior to their graduate year and hence must complete only 34 additional quarter hours of credit.

The Power Option is also available to students electing a normal two-year cooperative plan or a one-year full-time, non-cooperative plan.

Courses taken by students in the six-year integrated program are:

Fall Academic Quarter	Credit	Spring Academic Quarter	Credit
3.928 Analysis of Power Circuits	4	3.931 Power Systems Planning	4
3.990 Seminar I	2	3.991 Seminar II	2
3.995 Thesis or Elective . .	4	3.995 Thesis or Elective . .	4
Electives	6	Electives	8
	<hr/> 16		<hr/> 18
*10.806 Advanced Mathematics	4	*10.831 Probability	2
	<hr/> 20		<hr/> 20

Electives

In addition to the electives listed under the regular day graduate cooperative program, the following other elective course areas are suggested for the Power Option:

Courses	Credits
2.937 Power Plant Economics . .	4
2.920 Direct Energy Conversion .	4
3.930 Electric Machine Theory . .	2
3.932 Power System Protection . .	2
3.933 Power System Transients .	2
3.943 Advanced Power Laboratory	2
3.944 Special Topics in Power . .	2
5.801 Analysis of the Industrial Enterprise	2
5.802 Analysis of the Industrial Enterprise	2

*Taken by six-year students during undergraduate quarters 9 and 10.

THE DOCTOR'S DEGREE

Full-Time Program

The following material outlines the procedures for admission to the doctoral program and the steps necessary to qualify for the Ph.D. degree. For further information applicants should write to the Chairman of the Department of Electrical Engineering.

Admission

Students who have completed forty quarter hours of graduate work with a satisfactory record should apply for an interview with a departmental staff member designated by the Electrical Engineering Departmental Graduate Committee. The application form for this appointment may be obtained from the Graduate Division Office. This application, together with transcripts of all prior work and two letters of recommendation, should be forwarded to the Electrical Engineering Doctoral Committee no later than March 1. After examination of this material an applicant will be notified of the time of his appointment for an interview. Based upon the interview, successful applicants must file a formal application for admission to the doctoral program. The applicant will then be notified concerning the time at which the qualifying examination must be taken.

Residence Requirement

The residence requirement is satisfied by one year of full-time graduate work or two consecutive years of part-time graduate work. In the latter case, a detailed time schedule must be approved by the student's adviser in order to give evidence that at least half of the time is being devoted to the requirements of the Graduate Division program.

Degree Candidacy

Degree candidacy is established in accordance with the general Graduate Division regulations.

Qualifying Examination

The qualifying examination is composed of a written and an oral part. The written part covers the following general categories: (1) circuits, systems and electronics, (2) electromagnetic fields, (3) physics, and (4) mathematics. The oral examination is designed to test general comprehension. These examinations are normally taken after successful completion of forty quarter hours of graduate work. If the examination is failed, it may be repeated with permission of the department.

Comprehensive Examination

During the time in which a student is a candidate for a doctoral degree he may be required to demonstrate by means of a comprehensive examination a subject matter knowledge satisfactory for the award of the degree.

Course Requirements

The course requirements, in addition to the minimum requirement of forty quarter hours, are established by the department graduate committee for each candidate except for courses 3.983 and 3.984 which are required of all candidates.

Thesis

In some cases, arrangements for a thesis adviser may have been established before the completion of the qualifying examinations. In any case, such arrangements must be made as soon as possible after degree candidacy has been established. Depending upon the nature of a project, a thesis committee may be appointed by the chairman of the department. This committee will be kept informed of the progress of the thesis and will approve the thesis in its final form.

Foreign Language

The foreign language requirement may be satisfied in French, German, or Russian. The Educational Testing Service Language Examination is used for this purpose. The examination may be administered at Northeastern University or at another institution.

Final Oral Examination

This examination will be held in accordance with the general Graduate Division regulations.

THE MASTER'S DEGREE**Part-Time Evening Program****Electrical Engineering****Admission**

The admission requirements for the part-time evening program leading to the degree of Master of Science in Electrical Engineering are the same as for the full-time program, but students may progress according to their abilities and the time available.

All graduate courses presuppose mastery of the subject matter of a modern, fully accredited curriculum in electrical engineering. Applicants who have not taken further academic work for some time since they received their bachelor's degree may be required to take graduate courses to satisfy any deficiencies. For this purpose, the following courses are available:

		Credits
3.975	Precis of Modern Electrical Engineering I	2
3.976	Precis of Modern Electrical Engineering II	2
3.977	Precis of Modern Electrical Engineering III	2
10.801	Advanced Mathematics	2
10.802	Advanced Mathematics	2

These courses carry graduate credit but a maximum of four quarter hours of credit from this group may be used as elective credit in the degree program.

Program

To a substantial extent, the program of study is an elective one. The student is expected to select a well-balanced group of courses emphasizing one or two aspects of electrical engineering. Forty quarter hours of academic work are required for the master's degree of which eight quarter hours of credit are specified as follows:

	Required Courses	Credits
3.825	Transients in Linear Systems A	2
3.826	Transients in Linear Systems B	2
10.804	Advanced Mathematics	2
10.805	Advanced Mathematics	2
		<hr/> 8

Electives

Thirty-two quarter hours of credit are elective. Twenty quarter hours of credit must be chosen from the Electrical Engineering Department.

A maximum of 12 quarter hours of credit may be selected from graduate courses in sciences or other engineering departments for which the student has the necessary preparation. However, any such course should be taken in the major department concerned with the subject matter. For example, a course largely involving mathematical techniques should be taken in the Mathematics Department.

Quarter-Sequence Courses

Certain courses have an A or B after the course title. In these cases, credit will be given toward the degree only if both the A and B courses are successfully completed.

Electro-Optics (Modern Optics) Program

The Electro-Optics Program is a new program structured to provide the engineer or scientist with a strong background in modern optics.

Admission

To be enrolled for this degree program, applicants must have a bachelor's degree in electrical engineering or physics from a recognized institution.

Program

Forty quarter-hours of academic work are required, of which 32 are specified. Four hours of electives in optics are to be chosen from two sequences and four hours of electives may be selected from courses in science or engineering.

	Courses	Credits
10.804	Advanced Mathematics	2
10.805	Advanced Mathematics	2
*11.801	Introductory Modern Physics	2
3.900	Communication Theory	2
3.901	Communication Theory	2
3.914	Geometric Optics I	2
3.915	Geometric Optics II	2
3.916	Physical Optics I	2
3.917	Physical Optics II	2
3.918	Image Evaluation and Optical System Criterion I	2
3.919	Image Evaluation and Optical System Criterion II	2
3.920	Image Evaluation and Optical System Criterion III	2
3.921	Optical Properties of Matter I	2
3.922	Optical Properties of Matter II	2
3.923	Optical Properties of Matter III	2
3.980	Optical Design Concepts	2

Comprehensive Examination

Candidates for the master's degree in Electro-optics are expected to demonstrate competence in several areas including geometric and physical optics. This will be in the form of a written examination and may be taken after the successful completion of the required course work[†].

Optics Electives

Sequence I	Credits
3.981 Radiometry and Photometry	2
3.982 Infra Red [†] and Detector Theory	2

*Persons with degrees in Physics may substitute 3.975, Precipitation of Modern Electrical Engineering I).

[†]By special arrangement with the faculty a student may substitute 3.924, Advanced Optics Laboratory and Current Developments, for the examination requirement.

Sequence II		Credits
3.983	Classical Coherence Theory	2
3.984	Spectroscopy and Interferometry	2

An additional four quarter hours of electives may be selected from appropriate Science or Engineering courses.

DESCRIPTION OF COURSES

All courses carry two quarter hours of credit unless otherwise noted. Courses carrying four quarter hours of credit are day courses. Course descriptions are applicable to both day and evening courses. Quarters indicated following course descriptions refer primarily to the part-time program.

3.800 Applied Electron and Ion Physics I Prep. Bachelor of Science degree in Electrical Engineering or Physics or 3.977, *Precis of Modern Electrical Engineering III*
The dynamics of charged particles in electromagnetic fields. The topics stressed are those closely related to engineering applications. The topics to be covered in the first quarter are: summary review of vector analysis and electromagnetic field theory; non-relativistic dynamics of electrons and ions in static electric and magnetic fields; introduction to electron and ion beam optics; space charge effects. (Offered yearly, Fall Quarter)

3.801 Applied Electron and Ion Physics II Prep. 3.800, Applied Electron and Ion Physics I
Continuation of 3.800. Topics to be covered are: dynamics of charged particles in time-varying electromagnetic fields; applications to beam-wave interaction phenomena and microwave electronic devices; relativistic effects in charged particle dynamics in fields; application to high energy physics devices. (Offered yearly, Winter Quarter)

3.802 Applied Electron and Ion Physics III Prep. 3.801, Applied Electron and Ion Physics II
Continuation of 3.801. Topics in physical electronics; large aggregations of electrons; electron emission, Fermi-Dirac statistics; introduction to plasma physics; Boltzmann equation; kinetic theory and quasi-hydrodynamical approach to dynamics of fully and partially ionized gases; collisions; pinch effect, magneto-ionics; wave propagation in plasma media; beam-plasma-wave interactions. (Offered yearly, Spring Quarter)

3.803 Applied Electron and Ion Physics Prep. Bachelor of Science degree in Electrical Engineering or Physics or 3.977, *Precis of Modern Electrical Engineering III*
Offered only to day students. Includes the material given in 3.800 and 3.801, Applied Electron and Ion Physics I and II. (Offered yearly, Winter Quarter)

3.806 Lasers I

Prep. Bachelor of Science degree in
Engineering or Science

Device design theory, fabrication and technology, and applications of lasers will be presented in detail. A course in or familiarity with introductory quantum mechanics or semiconductor physics is desirable but not essential.

(Offered yearly, Fall Quarter)

3.807 Lasers II

Prep. 3.806, Lasers I

Further material on the design theory, fabrication and applications of lasers will be presented with special emphasis on the more complex problems and the underlying mathematical analysis. A few applications will be considered in detail, such as optical ranging, and optical information processing.

(Offered yearly, Winter Quarter)

3.808 Optoelectronic Engineering

Prep. Bachelor of Science degree
in Electrical Engineering or Physics

Course 3.806 Lasers I and Course 3.851, Theory of Semi-Conductor Devices B, or their equivalents are helpful but not essential.

Fundamental concepts, design theory and system theory of optoelectronics will be presented including analysis of sources detectors, switches, display information processing holography and tracking. (Offered yearly, Spring Quarter)

3.810 Physics of the Upper Atmosphere I

Prep. Bachelor of
Science degree in Engineering or Science
(Offered 1968-69, Fall Quarter)

3.811 Physics of the Upper Atmosphere II

Prep. 3.876,
Electromagnetic Theory B or 3.877, Electromagnetic Theory
(Offered 1968-69, Winter Quarter)

3.812 Physics of the Upper Atmosphere III

Prep. 3.810 and 3.811,
Physics of the Upper Atmosphere I and II
(Offered 1968-69, Spring Quarter)

This series of courses treats the physics of the atmosphere from the lowest parts of the ionized regions upwards, and includes some of the relevant aspects of solar-terrestrial relations. Topics discussed include geomagnetism, the motion of charged particles in fields, the polar aurora, airglow, propagation of electromagnetic waves in ionized media, layer formation in the atmosphere, the earth's ionosphere, rocket and satellite borne probes, and modern theoretical work on these topics.

3.817 Acoustics I

Prep. Bachelor of Science degree
in Engineering or Science

The wave equation in one, two, and three dimensions; absorption and transmission phenomena; ray acoustics; energy density and intensity of sound waves.

(Offered yearly, Fall Quarter)

3.818 Acoustics II

Prep. 3.817, Acoustics I

Electro-mechano-acoustic systems, lumped-parameter analysis, sound measurements, experimental acoustics, piezoelectric and magnetostrictive transducers, reproduction of sound.

(Offered yearly, Winter Quarter)

3.819 Acoustics III

Prep. 3.818, Acoustics II

Elements of ultrasonics, underwater sound, psychoacoustics, and architectural acoustics.

(Offered yearly, Spring Quarter)

3.820 Mathematical Methods in Electrical Engineering I

Prep.

Bachelor of Science degree in Engineering or Physical Science
 Definition and representation of a complex variable and functions of a complex variable. Laurent series, residues, contour integration, conformal mapping and Riemann surfaces. Electrical Engineering applications to Fourier theory, Hilbert transforms, stability of linear systems and electrostatics. (Not open to Northeastern graduates who have completed 3.292)

(Offered yearly, Fall Quarter)

3.821 Mathematical Methods in Electrical Engineering II

Prep. 10.805,

Advanced Mathematics or 10.806, Advanced Mathematics

Linear algebra and matrix analysis applied to systems theory; linear equations, determinants, invariance, quadratic forms, eigenvalues and the simultaneous diagonalization of two matrices. Compound matrices and the Binet-Cauchy Theorem. Illustrative applications to Electrical Engineering problems drawn from circuit theory, topology, probability theory and engineering physics.

(Offered yearly, Winter Quarter)

3.825 Transients in Linear Systems A

Prep. Bachelor of Science

degree in Electrical Engineering or 3.975, Precs of

Modern Electrical Engineering I

Basic concepts of system theory with State Variable formulation of system differential equations. Solution of state equations for linear, time-invariant systems.

(Offered yearly, Fall, Winter, and Spring Quarters)

3.826 Transients in Linear Systems B

Prep. 3.825, Transients in

Linear Systems A

Continuation of 3.825 with consideration of canonical forms for computer simulation. Practical elements of transient response and system stability.

(Offered yearly, Fall, Winter, and Spring Quarters)

3.827 Transients in Linear Systems

Prep. Bachelor of Science

degree in Electrical Engineering or 3.975, Precs of

Modern Electrical Engineering I

Offered only to day students. Includes the material given in 3.825, Transients in Linear Systems A and 3.826, Transients in Linear Systems B.

4 Q.H. credits

(Offered yearly, Fall and Winter Quarters)

3.830 Linear Circuit Theory I-A

Prep. Bachelor of Science degree

in Electrical Engineering or 3.975, Precs of

Modern Electrical Engineering I

Matrix circuit analysis including m-port parameter systems. Positive real functions. Energy function. Driving-point synthesis techniques for LC, RC, and RL networks.

(Offered yearly, Fall, Winter, and Spring Quarters)

3.831 Linear Circuit Theory I-B

Prep. 3.830, Linear Circuit Theory I-A

Driving-point synthesis techniques with RLC networks. Properties of two-port networks. Two-port synthesis including the parallel ladder realization. Lattice synthesis.

(Offered yearly, Fall, Winter, and Spring Quarters)

3.832 Linear Circuit Theory I

Prep. Bachelor of Science
degree in Electrical Engineering or 3.975, *Precis of
Modern Electrical Engineering I*

Offered only to day students. Includes the material given in 3.830, *Linear Circuit Theory I-A* and 3.831, *Linear Circuit Theory I-B*.

4 Q.H. credits.

(Offered yearly, Fall and Spring Quarters)

3.833 Linear Circuit Theory II

Prep. 3.831, *Linear Circuit Theory I-B*
or 3.832, *Linear Circuit Theory I*

Synthesis of resistance-terminated two-port networks including techniques due to Darlington and Miyata. Double-resistive-terminated lossless two-port networks. Elements of m -port synthesis.

(Offered 1968-69, Fall Quarter)

3.834 Linear Circuit Theory III

Prep. 3.831, *Linear Circuit Theory I-B*
or 3.832, *Linear Circuit Theory I*

Introduction to the approximation problem. Criteria of approximations. Frequency-domain approximations including those of Butterworth, Chebyshev, and Bessel. Use of potential theory analogies. Approximation over a prescribed frequency band. Minimization and correction of distortions in linear networks.

(Offered 1968-69, Winter Quarter)

3.835 Linear Circuit Theory IV

Prep. 3.831, *Linear Circuit Theory I-B*
or 3.832, *Linear Circuit Theory I*

Techniques of time-domain synthesis. Time-domain approximations including the use of orthonormal functions. Prony's method, Pade's method and interpolation functions. Time-domain synthesis of delay networks.

(Offered 1968-69, Spring Quarter)

3.837 Topological Circuit Analysis and Linear Graphs

Prep. 10.806,

Advanced Mathematics or equivalent

Mathematical properties of the Kirchoff equations. Matrix and topological circuit analysis. Models for linear networks; unistor; gyrator, gyration. Selected applications of graph theory in the fields of network synthesis, switching theory, and communication networks.

(Offered 1968-69, Fall Quarter)

3.838 Nonlinear Circuit Analysis I

Prep. 3.831, *Linear Circuit Theory I-B* or 3.832, *Linear Circuit Theory I*

Numerical, graphical, and analytical methods for the solution of physical systems described by nonlinear differential equations. Geometric analysis in second-order systems. Perturbation and averaging theory.

(Offered yearly, Winter Quarter)

3.839 Nonlinear Circuit Analysis II

Prep. 3.838, *Nonlinear
Circuit Analysis I*

Linear, time-varying systems and their relationship to certain nonlinear problems. The WKB approximation. The Hill and Mathieu Equations. Stability on nonlinear systems. Lyapunov Theory. Selected topics in nonlinear analysis according to group interest.

(Offered yearly, Spring Quarter)

3.840 Linear Active Circuits A

Prep. Bachelor of Science
degree in Electrical Engineering or 3.976, *Precis
of Modern Electrical Engineering II*

Active networks are developed from device representation and appropriate circuit theory concepts. Topics included are application of flowgraphs and matrices

to design and analysis, development of solid state device models, stability, integrated circuitry limitations and dominant pole analysis and realization from open and short-circuit impedance concepts. These are applied to the realization, operation and optimization of gainband-width products of wide-band amplifiers to obtain specific characteristics such as Butterworth and other functions. (Not open to students who have completed 3.845, Semi-Conductor Theory I or 3.605, Transistor Circuit Engineering.) (Offered yearly, Fall Quarter)

3.841 Linear Active Circuits B Prep. 3.840, Linear Active Circuits A
The results of 3.840, Linear Active Circuits A, are extended to include narrow-band, band pass amplifiers and feedback amplifier concepts. The effects of feedback upon gain, impedance noise and stability are developed from return difference and ratio viewpoints utilizing open and short-circuit loop gain concepts. Consideration is given to the synthesis of driving point and transfer functions using active filters, negative impedance converters and other basic building blocks. (Not open to students who have completed 3.846, Semi-Conductor Theory II or 3.606, Transistor Circuit Engineering.) (Offered yearly, Winter Quarter)

3.842 Linear Active Circuits Prep. Bachelor of Science
degree in Electrical Engineering or 3.976, Precis
of Modern Electrical Engineering II
Offered only to day students. Includes the material given in 3.840, Linear Active Circuits A and 3.841, Linear Active Circuits B.
4 Q.H. credits. (Offered yearly, Fall and Winter Quarters)

3.843 Linear Active Networks Prep. 3.841, Linear Active Circuits B or
3.842, Linear Active Circuits
A continuation of the material covered in Linear Active Circuits A and B. Emphasis will be placed on feedback amplifier systems, including multiloop amplifier design. These techniques will be applied to integrated circuit realizations of basic active networks. (Offered yearly, Spring Quarter)

3.850 Theory of Semi-Conductor Devices A Prep. Bachelor of Science
degree in Engineering or Science
The fundamental concepts and theory underlying the present day semi-conductor devices will be presented for the electronics engineer. Subjects covered include: energy-band theory, equilibrium distributions, carrier transport phenomena, the diode equation. (Offered yearly, Winter Quarter)

3.851 Theory of Semi-Conductor Devices B Prep. 3.850, Theory of
Semi-Conductor Devices A
Subjects covered include: physical behavior and circuit models for junction and field-effect transistors, physical limitations on transistor performance, and as time permits, special topics such as thyristors and junction lasers. (Offered yearly, Spring Quarter)

3.852 Theory of Semi-Conductor Devices Prep. Bachelor of Science
degree in Engineering or Science
Offered only to day students. Includes the material given in 3.850, Theory of Semi-Conductor Devices A and 3.851, Theory of Semi-Conductor Devices B.
4 Q.H. credits. (Offered yearly, Winter Quarter)

3.856 Microelectronics I

Prep. Bachelor of Science
degree in Engineering or Science

The fundamentals for microelectronics will be reviewed, including band theory, physical parameters, crystal growth, masking diffusion, isolation, etc. Simple integrated circuit design and fabrication will then be analyzed. Emphasis will be placed on the monolithic silicon integrated circuit approach.

(Offered 1968-69, Fall Quarter)

3.857 Microelectronics II

Prep. 3.856, Microelectronics I

The electrical and physical design of microelectronic (integrated) circuits will be considered in detail. Detailed examples in digital logic and precision linear amplifiers will be included.

(Offered 1968-69, Winter Quarter)

3.860 Pulse Processing I

Prep. Bachelor of Science
degree in Electrical Engineering or 3.975, 3.976 and 3.977,

Precis of Modern Electrical Engineering I, II and III

The principles and techniques of pulse-forming and pulse-processing circuits basic radar, television, digital computation, pulse modulation systems, and data-processing systems. Wave shaping circuits, logic circuits, switching circuits, digital devices and time base generators will be covered.

(Offered 1968-69, Winter Quarter)

3.861 Pulse Processing II

Prep. 3.860, Pulse Processing I

Continuation of 3.860, Pulse Processing I, to include digital filters and correlators, pulse transformers, memory devices, and linear delay devices.

(Offered 1968-69, Spring Quarter)

3.865 Radar Systems I

Prep. Background in Probability
and Fourier Analysis

Emphasis on the systems aspects of radar engineering. Topics covered include antennas; low-noise receivers; high-power transmitters; range, angle, and Doppler tracking systems; search radar systems. Mathematical descriptions are used throughout.

(Offered yearly, Fall Quarter)

3.866 Radar Systems II

Prep. 3.865, Radar Systems I

Continuation of 3.865, Radar Systems I, a further consideration of systems aspects. The principles of radar detection theory; matched filter and correlation receiver design; radar ambiguity function; radar uncertainty principles; radar waveform synthesis; fundamental accuracy limits; generalized tracking problems.

(Offered yearly, Winter Quarter)

3.871 Space Electronics Systems I

Prep. Knowledge of
Fourier Transforms

Primarily concerned with aerospace communications, Antenna gain, space loss, cosmic and atmospheric noise, polarization loss and receiver noise temperature will be discussed as factors influencing the system signal-to-noise ratio. Contemporary signal processing and modulation systems will be analyzed in some detail in order to arrive at comparative performance figures. Treatment of frequency division multiplexing will include commutation, smoothing, sub-carrier pre-emphasis and phase-locked discrimination.

(Offered yearly, Fall Quarter)

3.872 Space Electronics Systems II

Prep. 3.871, Space Electronic
Systems I

Continuation of 3.871, Space Electronic Systems I, to include communication systems suitable for deep space probes. Multiplex systems with major concentration on various time multiplex systems. Emphasis will be placed upon code formulation for signal transmission, matched filtering upon reception and data processing. Typical instrumentation systems will be discussed as illustrations.
(Offered yearly, Winter Quarter)

3.875 Electromagnetic Theory A

Prep. Advanced Calculus and
Vector Analysis

Fundamental study of the differential and integral forms of Maxwell's equations. Constitutive relations and associated boundary conditions. Solutions of the vector Helmholtz equations. Potential theory.
(Offered yearly, Fall Quarter)

3.876 Electromagnetic Theory B

Prep. 3.875, Electromagnetic Theory A

A detailed study of the application of Maxwell's equations to problems in radiation, propagation in complex media, scattering diffraction and related topics.
(Offered yearly, Winter Quarter)

3.877 Electromagnetic Theory

Prep. Advanced Calculus and
Vector Analysis

Offered only to day students. Includes the material given in 3.875, Electromagnetic Theory A and 3.876, Electromagnetic Theory B.

4 Q.H. credits.
(Offered yearly, Winter and Spring Quarters)

3.880 Microwave Theory

Prep. 3.876, Electromagnetic Theory B
or 3.877, Electromagnetic Theory

Propagation of electromagnetic waves on periodic structures. Propagation on a helix. Waves on electron beams. Coupled-mode theory. Travelling wave devices. Propagation in anisotropic media. Ferrite devices.

(Offered yearly, Spring Quarter)

3.881 Microwave Circuits I

Prep. 3.876, Electromagnetic Theory B
or 3.877, Electromagnetic Theory

Review of microwave circuit theorems; scattering matrices and applications; eigenvalue problem; symmetrical and miscellaneous junctions; applications of 3-db couplers; polarizers, phase shifters and attenuators; non-reciprocal and ferrite devices.
(Offered yearly, Winter Quarter)

3.882 Microwave Circuits II

Prep. 3.881, Microwave Circuits I

One-port resonant cavity; transmission cavity; analysis and synthesis of microwave filters; travelling-wave resonators; periodically loaded lines; selected microwave system considerations.
(Offered yearly, Spring Quarter)

3.885 Antenna Theory

Prep. 3.876, Electromagnetic Theory B
or 3.877, Electromagnetic Theory

An advanced study of the radiation and circuit properties of antennas in simple and complex media. Special topics in array theory and particular types of antennas will be presented as an application of the general theory. Problems related to antennas in space and radio astronomy will also be covered. Designed to prepare the student for advanced research in the field.

(Not offered 1968-69)

3.890 Electromagnetic Wave Propagation I

Prep. 10.806, Advanced
Mathematics or equivalent

Topics in wave propagation of prime importance in communications and space physics. Review of wave propagation in a homogeneous medium. Physical processes in the atmosphere. The formation and structure of the ionosphere. Basic magneto-ionic theory. Propagation of waves in a spatially varying medium. Ray theory.
(Offered 1968-69, Winter Quarter)

3.891 Electromagnetic Wave Propagation II

Prep. 3.890,
Electromagnetic Wave Propagation I

Application of the theory of the oblique incidence of radio waves on the ionosphere, including the effects of the presence of the geomagnetic field, to radio communications. The interpretation of ionograms. Path prediction and field strength computations. Absorption. Top side soundings. Incoherent thermal scatter. Ionospheric irregularities and motions, and their study by space and frequency diversity techniques and other methods.
(Offered 1968-69, Spring Quarter)

3.900 Communication Theory — Introduction A

Prep. Undergraduate
course in Laplace Transforms or Complex Variables

The first course in the communication theory sequence which is to present an engineering analysis of statistical communication problems. Designed to provide the basic tools for the study of linear optimum filtering theory, information theory, and detection theory, which are the subject matters of subsequent courses. Particular topics include signal theory, Fourier analysis, power spectrum and correlation function, sampling theorem and an introduction to probability theory.
(Offered yearly, Fall, Winter, and Spring Quarters)

3.901 Communication Theory — Introduction B

Prep. 3.900,
Communication Theory — Introduction A

Continuation of course 3.900, Communication Theory — Introduction A. It deals first with the description and analysis of signals and noise as stochastic processes. Then as an application of the statistical techniques, Wiener's theory of linear optimum filtering and prediction will be presented.
(Offered yearly, Fall, Winter, and Spring Quarters)

3.902 Communication Theory — Introduction

Prep. Knowledge of
Laplace Transforms or Complex Variables

Offered only to day students. Includes the material given in 3.900, Communication Theory — Introduction A and 3.901, Communication Theory — Introduction B.

4 Q.H. credits.

(Offered yearly, Fall and Winter Quarters)

3.903 Communication Theory — Information Theory and Coding A

Prep. 3.900, Communication Theory — Introduction A or
3.902, Communication Theory — Introduction or Probability

Deals principally with three aspects of information theory; the statistical description of sources and the probabilistic measure of their information contents, the determination of channel capacity, and the fundamental coding theorems.
(Offered yearly, Fall, Winter and Spring Quarters)

3.904 Communication Theory — Information Theory and Coding B

Prep. 3.903, Communication Theory — Information Theory and Coding A

Continuation of 3.903, Communication Theory — Information Theory and Coding A. The theory of coding and decoding for efficient and reliable communication. Particular subjects include the derivation of theoretical bounds of error in coding, methods of constructing algebraic and probabilistic codes, and decoding techniques. Some knowledge of elementary aspects of modern algebra is desirable but not necessary. (Offered yearly, Fall, Winter, and Spring Quarters)

3.905 Communication Theory — Information Theory and Coding

Prep. 3.900, Communication Theory — Introduction A or Probability

Offered only to day students. Includes the material given in 3.903, Communication Theory — Information Theory and Coding A and 3.904, Communication Theory — Information Theory and Coding B.

4 Q.H. credits.

(Offered yearly, Spring Quarter)

3.906 Communication Theory — Detection A

Prep. 3.901, Communication Theory — Introduction B or 3.902, Communication Theory Introduction

This course presents a theory of signal detection in the presence of noise based on statistical methods of hypothesis testing and an introduction to sequential detection methods. Applications include the detection of known signals, signals with unknown parameters, such as random phase, and binary signals with inter-symbol interference. Error probabilities are calculated for coherent and non-coherent M-ary signalling. Tools of analysis include representation of random processes, such as the Karhunen-Loève Theorem, and Time-Frequency Duality.

(Offered yearly, Winter Quarter)

3.907 Communication Theory — Detection B

Prep. 3.906, Communication Theory — Detection A

This course is a continuation of 3.906. It deals with the theory of estimation of signal parameters in the presence of noise based on statistical methods of estimation. The radar range and velocity resolution problem and the signal design problem are studied with the aid of the Ambiguity Function. Additional applications include adaptive detection of digital signals with unknown parameters, detection of noise-like signals in noise, and demodulation of analog communication through a randomly time-varying channel.

(Offered yearly, Spring Quarter)

3.908 Special Topics in Communication Theory

Prep. 3.904, Communication Theory — Information Theory and Coding B or 3.905, Communication Theory — Information Theory and Coding

This course is designed to discuss further in depth either the information theoretical or detection theoretical aspects of communication. The subject matter changes from year to year. Selected topics are covered in seminars, prepared by Ph.D. candidates, in which the students participate in reading and discussing current technical literature on the subject.

(Offered 1968–69, Fall and Spring Quarters)

- 3.909 Communication Theory — Detection** Prep. 3.901, Communication Theory — Introduction B or 3.902, Communication Theory Introduction
Offered only to day students. Includes the material given in 3.906, Communication Theory — Detection A and 3.907, Communication Theory — Detection B.
4 Q.H. credits. (Offered yearly, Winter Quarter)
- 3.910 Nonlinear Systems I** Prep. An undergraduate course in Signals and Systems and 3.900, Communication Theory-Introduction A or equivalent
Operators and functionals. Functional power series representation of nonlinear systems. Functional representation of the response of a nonlinear system when its input is either a constant, a sinusoid, a transient, or a random process. System transforms. Applications to the analysis and synthesis of nonlinear systems in terms of functional power series. (Offered yearly, Fall Quarter)
- 3.911 Nonlinear Systems II** Prep. 3.910, Nonlinear Systems I and either 3.901, Communication Theory — Introduction B or 3.902, Communication Theory — Introduction
Orthogonal systems of functionals. Representation and analysis of nonlinear systems in terms of orthogonal systems of functionals. The optimum nonlinear filter, predictor, and general operator. Special classes of nonlinear systems. Determination of optimum nonlinear systems for generalized error criteria.
(Offered yearly, Winter Quarter)
- 3.912 Nonlinear Systems III** Prep. 3.911, Nonlinear Systems II
Functional analysis of systems characterized by nonlinear differential equations. Operator approach to system theory and its relationship to differential equation representations. The methods of iteration in nonlinear theory and its application to feedback systems. (Offered yearly, Spring Quarter)
- 3.914 Geometric Optics I** Prep. 10.805, Advanced Mathematics or equivalent
(Offered yearly, Spring Quarter)
- 3.915 Geometric Optics II** Prep. 3.914, Geometric Optics I
(Offered yearly, Fall Quarter)
Fermats principle and the fundamental laws of image formation. Eikonal equation and Hamilton's characteristic functions — canonical formalisms. Matrix approach to paraxial optics and ray tracing. Aberration theory; 3rd order theory; thin lenses and concentric systems; basic elements of optical design.
- 3.916 Physical (wave) Optics I** Prep. 3.915, Geometric Optics II or equivalent
(Offered yearly, Winter Quarter)
- 3.917 Physical Optics II** Prep. 3.916, Physical Optics I
(Offered yearly, Spring Quarter)
Basic Properties of the electromagnetic field; Maxwell's equations and the wave equation. Scalar and vector waves; reflection refraction and propagation of waves. Polarization Theory of partial coherence; scattering. Theory of interference and diffraction; Huygen's — Fresnel and Kirchoff solutions; theory of

interferometric instrumentation. Advanced topics in the application of communication theory to optical problems; transfer and spread functions; spacial filtering.

3.918 Image Evaluation and Optical Systems Criterion I

Should be taken concurrently with 3.915, Geometric Optics II.

1 hour lecture, 2 hours laboratory. (Offered yearly, Fall Quarter)

3.919 Image Evaluation and Optical Systems Criterion II

Should be taken concurrently with 3.916, Physical (wave) Optics I.

1 hour lecture, 2 hours laboratory. (Offered yearly, Winter Quarter)

3.920 Image Evaluation and Optical Systems Criterion III

Should be taken concurrently with 3.917, Physical Optics II.

1 hour lecture, 2 hours laboratory. (Offered yearly, Spring Quarter)

These courses are intended to accompany 3.915, Geometric Optics II; 3.916, Physical (wave) Optics I; 3.917, Physical Optics II, to provide experimental background for the theory developed therein. They would include basic optical techniques such as alignment procedures, location of principal and nodal planes. Resolution studies including Rayleigh and other criteria, test targets and methods. Coherent imaging and Abbe's theory. Aberrations and evaluation techniques.

3.921 Optical Properties of Matter I

Prep. 11.801, Introductory Modern Physics or equivalent
(Offered yearly, Fall Quarter)

3.922 Optical Properties of Matter II

Prep. 3.921, Optical Properties of Matter I
(Offered yearly, Winter Quarter)

3.923 Optical Properties of Matter III

Prep. 3.922, Optical Properties of Matter II
(Offered yearly, Spring Quarter)

Emission processes; quantum theory of emission; emission, absorption and black body spectra, stimulated emission.

Detection; solid state, photoemissive, photovoltaic, photographic and physiological detection and measurement. Transmission; solids, liquids and gases, crystals and fibres.

3.924 Advanced Optics Laboratory and Current Developments

Prep. Consent of the Director of the Electro-Optics program.

Special topics in modern optics and optical techniques requiring the presentation of a thesis by participants at termination of the course.

(Offered by special arrangement)

Additional courses on the optics sequence are 3.980, 3.981, 3.982, 3.983, and 3.984.

3.925 Power Circuit Analysis I

Prep. Bachelor of Science degree in Electrical Engineering

Fundamental concepts of single-phase and polyphase power systems; definitions of terms; use of per unit quantities; equivalent circuits of symmetrical 3-phase

systems; introduction to symmetrical components; short circuits on systems with a single power source. (Offered yearly, Fall Quarter)

3.926 Power Circuit Analysis II Prep. 3.925, Power Circuit Analysis I
This course is a continuation of 3.925, Power Circuit Analysis I. Sequence impedances of various power-system elements are considered from application point of view; unsymmetrical faults on otherwise symmetrical 3-phase systems; open conductors and asymmetrical connections and loadings; analysis of simultaneous faults on 3-phase systems; 2-phase systems. (Offered yearly, Winter Quarter)

3.927 Power Circuit Analysis III Prep. 3.926, Power Circuit Analysis II
This course is a continuation of 3.926, Power Circuit Analysis II. Introduction to Clarke components and applications in analysis of asymmetrical systems and faults; transmission line theory; protective relaying; fundamentals of system stability. (Offered yearly, Spring Quarter)

3.928 Analysis of Power Systems Prep. Bachelor of Science degree in Electrical Engineering
Offered only to day students. This course is designed to provide the basic material, including special mathematical techniques, applicable to the solution of problems associated with power systems. The sequence-impedance characteristics of various power-system elements are investigated with emphasis on application rather than design. Abnormal situations including simultaneous faults and system transients are treated in depth, making use of Clarke components and modified Clarke components as well as symmetrical components. Polyphase transmission line theory, system protection and system stability are introduced and discussed briefly. 4 Q.H. credits. (Offered yearly, Fall Quarter)

3.930 Power System Planning Prep. 3.925, Power Circuit Analysis I
Engineering and economic aspects underlying system development and planning. Probability methods of determining installed and spinning-reserve requirements. Mathematical models of system operation for production-costing studies. Detailed examples include economic comparison of nuclear and fossil-fired plants, the role of pumped-hydro generation, power pooling, and coordinated planning of interconnected systems, and the functions of high-voltage and EHV transmission in planning and operation. (Offered 1968-69, Spring Quarter)

3.931 Power System Planning Prep. 3.928, Analysis of Power Systems or equivalent
Offered only to day students. Includes the material given in 3.930 but with more extensive and in depth coverage. 4 Q.H. credits. (Offered yearly, Spring Quarter)

3.932 Power Systems Protection Prep. 3.927, Power Circuit Analysis III or equivalent
Consideration of protection applied to generation, transmission and distribution. Investigation of the characteristics and operating principles of various methods of protective relaying. (Offered 1968-69, Fall Quarter)

3.933 Power System Transients

Prep. 3.927, Power Circuit Analysis III or equivalent

Transients in power systems due to system switching, lightning or faults. Travelling wave phenomena; insulation coordination; overvoltages due to disturbances on the system.
(Offered 1968-69, Winter Quarter)

3.940 Electric Machinery Theory I

Prep. Bachelor of Science degree in Electrical Engineering or 3.975, 3.976, and 3.977, Precs of Modern Electrical Engineering I, II, and III

Review of electromagnetic theory as applied to electrical machines; dynamic analysis of a-c induction machines; special topics in the operation of d-c machines.
(Offered yearly, Fall Quarter)

3.941 Electric Machinery Theory II

Prep. 3.940, Electric Machinery Theory I

Analysis of the principles of operation of synchronous generators and motors with comprehensive investigation of characteristics in terms of d-q components and symmetrical components; consideration of the transient behavior of the machine.
(Offered yearly, Winter Quarter)

3.942 Electric Machinery Theory III

Prep. 3.941, Electric Machinery Theory II

Dynamic behavior of electrical machinery; comprehensive treatment of the problem of stability as applied to electric machinery.
(Offered yearly, Spring Quarter)

3.943 Advanced Power Laboratory

Prep. Bachelor of Science degree in Electrical Engineering

Offered to day students only. In depth investigations of the steady-state and dynamic modes of operation of induction and synchronous machines. Polyphase rectification and control circuits.
(Offered yearly, all quarters)

3.944 Special Topics in Power

Prep. Permission of Instructor

Offered to day students only. Directed reading and discussion of topics of special interest in the power field.
(Offered yearly, all quarters)

3.950 Systems Analysis I

Prep. Bachelor of Science degree in Engineering or Science

Review of probability and statistics. Elements of Markov processes, queuing as a Markov process. Finite and infinite queue systems, multiple-server, parallel and sequential queuing. Flow-graph representation of queuing systems, equivalence of flow-graph and analog-computer representation.
(Offered yearly, Fall Quarter)

3.951 Systems Analysis II

Prep. 3.950, Systems Analysis I

Linear programming; transportation problem, graphical representation. Simplex method, concept of duality and its use. Fundamental concepts in game theory. Solution of rectangular games. Pure and mixed strategies, maximum and min-max principle. Zero and non-zero-sum games, infinite games. Transformation of games into linear programming problems. Other methods of solving competitive-situation problems.
(Offered yearly, Winter Quarter)

3.952 Systems Analysis III Prep. 10.805, Advanced Mathematics or 10.806, Advanced Mathematics
 Various methods of optimization of deterministic systems will be studied. Emphasis will be placed on steepest-descent and dynamic-programming methods. Examples from the fields of electrical, mechanical, and aerospace technology will be considered. (Offered yearly, Spring Quarter)

3.953 Systems Analysis IV Prep. 3.952, Systems Analysis III, 10.831, Probability, or equivalent
 Optimal stochastic control of linear systems; optimal filtering, prediction and identification; and adaptive control techniques will be studied. Statistical decision problems for linear and nonlinear systems. (Offered 1968-69, Fall Quarter)

3.957 Control Systems I-A — Analysis Prep. Knowledge of transient analysis and Laplace transforms
 Transient performance of linear feedback control systems for deterministic inputs. Block diagram representation and analog computer modelling of typical systems. Discussion of stability criteria. Development and application of root-locus and Nyquist methods for complementary time and frequency domain analysis. (Offered yearly, Fall Quarter)

3.958 Control Systems I-B — Synthesis Prep. 3.957, Control Systems I-A — Analysis
 Comparison of several compensation configurations for both static and dynamic performance criteria. System design using root-locus and Bode-Nichols methods. Discussion of pole-zero synthesis techniques and consideration of the multi-input problem. Practical aspects of system design and review of component technology. (Offered yearly, Winter Quarter)

3.959 Control Systems I — Analysis and Synthesis Prep. Knowledge of transient analysis and Laplace transforms
 Offered only to day students. Includes the material given in 3.957, Control Systems I-A — Analysis and 3.958, Control Systems I-B — Synthesis. 4 Q.H. credits. (Offered yearly, Fall Quarter)

3.960 Control Systems II-A — Nonlinear Systems Prep. 3.826, Transients in Linear Systems B or 3.827, Transients in Linear Systems
 Analog and digital computer solution of nonlinear system problems. Discussion of describing function and phase plane analysis techniques. Introduction to the methods of Liapunov. Design of intentionally nonlinear systems including comparison of compensation schemes for stabilization of bang-bang control systems. (Offered yearly, Spring Quarter)

3.961 Control Systems II-B — Stochastic Systems Prep. 3.960, Control Systems II-A — Nonlinear Systems
 Statistical models for random inputs encountered in the operation of control systems. Filtering and prediction, correlation functions and spectral densities. Optimum design for stationary random processes. Analog and digital simulation for system design. (Offered yearly, Fall Quarter)

3.962 Control Systems II — Nonlinear and Stochastic Systems

Prep. 3.826, Transients in Linear Systems B or 3.827, Transients in Linear Systems

Offered only to day students. Includes the material given in 3.960 Control Systems II-A — Nonlinear Systems and 3.961, Control Systems II-B — Stochastic Systems.

4 Q.H. credits.

(Offered yearly, Spring Quarter)

3.963 Digital and Sampled-Data Control Systems

Prep. 3.826, Transients in Linear Systems B or 3.827, Transients in Linear Systems

Treatment of linear sampled-data control systems by means of the z-transform. Development of methods for analysis and synthesis of control systems with digital components and sampled-data inputs. Discussion of related topics including difference equations and digital filtering. (Offered yearly, Winter Quarter)

3.964 Optimal Control Theory

Prep. 3.826, Transients in Linear Systems B or 3.827, Transients in Linear Systems

Discussion of the optimal control problems with reference to space and process control applications. Formulation of problem in terms of state variables. Variational calculus solution. Numerical solutions by dynamic programming and steepest-descent algorithms. (Offered yearly, Spring Quarter)

3.967 Switching Circuits I

Prep. Bachelor of Science degree in Engineering or Science

Basic relay networks will be treated by the methods of switching algebra. Combinational, sequential and counting circuits will be given as well as the theory of error detecting and translating circuits. (Offered yearly, Fall Quarter)

3.968 Switching Circuits II

Prep. 3.967, Switching Circuits I

Application of the material covered in 3.967, Switching Circuits I. This includes work with iterative networks, sequential circuits and special coding techniques. (Offered yearly, Winter Quarter)

3.970 Digital Computer Programming I

Prep. Bachelor of Science degree in Engineering or Science

Machine and assembly languages as an introduction to digital computer programming with emphasis on the hardware-software interface. The text is supplemented by current literature in the field and specific computers are discussed. (Offered yearly, Fall and Spring Quarters)

3.971 Digital Computer Programming II

Prep. 3.970, Digital Computer Programming I

Advanced programming techniques. Familiarity with basic programming tools (index registers, subroutines, etc.) is assumed. The course is an extension of 3.970 and should immediately follow that course wherever possible. Applications to real problems are used to illustrate such topics as: list structured storage, man-machine interfaces, higher languages, programming systems and simulation. (Offered yearly, Winter Quarter)

3.972 Design Principles of Electronic Digital Computers I

(Central Processing)

Prep. Knowledge of pulsed circuits

This course treats the engineering aspects of modern digital computer design. Basic elements of a digital computer system. The essential features of the Central Processor. Arithmetic operations: addition, subtraction, multiplication, division; floating point arithmetic configuration; special circuits for low cost computing.

(Offered yearly, Spring Quarter)

3.973 Design Principles of Electronic Digital Computers II

(Memory Subsystems)

Prep. 3.972, Design Principles of Electronic Digital Computers I

Synchronous sequential circuits; counters; shift registers; memory devices; types of memories: organization, cycle time and addressing; levels of storage capacity, operating speed and cost/bit; special function memories (Read only; associative and block oriented); mass storage; memory hierarchies for optimum system efficiency. Consideration will be given to the physical realization of memory arrays; magnetic cores, thin films, cryogenics, mos and bipolar integrated circuit matrices.

(Offered yearly, Fall Quarter)

3.974 Design Principles of Electronic Digital Computers III

(Man-Machine and Machine-Machine Communication)

Prep. 3.973, Design Principles of Electronic Digital Computers II

Input-output devices, hybrid computation; A/D and D/A conversion techniques. Computer graphics; non-impact printing; optical techniques for mass storage. Design of a general-purpose computer (timing diagrams, component tolerances, hardware problems); new trends in digital computer design.

(Offered yearly, Winter Quarter)

Additional computer courses are: 3.985, 3.986, and 3.987.

3.975 Precis of Modern Electrical Engineering I

Prep. Bachelor of Science Degree in Engineering or Science plus knowledge of matrix algebra
(Offered yearly, Fall Quarter)

3.976 Precis of Modern Electrical Engineering II

Prep. Bachelor of Science degree in Engineering or Science
(Offered yearly, Winter Quarter)

3.977 Precis of Modern Electrical Engineering III

Prep. Bachelor of Science degree in Engineering or Science
(Offered yearly, Spring Quarter)

The preceding three precis courses are intended primarily for those whose undergraduate major was in an engineering or scientific field other than electrical engineering. They are also recommended for students 5 to 10 years away from their bachelor's degree in Electrical Engineering who feel the need for a review of electrical science. They are open only to students in these categories. The material is basically undergraduate in nature but the viewpoint and depth are at the mature level appropriate to graduate students. Part I deals with the theory of electric circuits and linear systems, Part II with electronics, and Part III with field theory from the engineering viewpoint.

3.980 Optical Design Concepts

Prep. 3.914 and 3.915
Geometric Optics I and II

This course is an extension in depth of the material covered in the geometric optics sequence. It will include such topics as: Fourier optics, coherent non-coherent and partially coherent systems, and the diffraction theory of aberrations with application to optical systems. Techniques will include numerical methods of solution.
(Offered yearly, Spring Quarter)

3.981 Radiometry and Photometry

Prep. 3.917, Physical Optics II
(Offered yearly, Winter Quarter)

3.982 Infra-red and Detector Theory

Prep. 3.981, Radiometry and
Photometry
(Offered yearly Spring Quarter)

These two courses represent the first optics elective sequence. They include topics on the generation, detection and measurement of optical radiation with emphasis on the infra-red region; the study of systems for radiation detection; noise limitations in optical measurements to optimizing detector systems.

3.983 Classical Coherence Theory

Prep. 3.917, Physical Optics II
(Offered yearly, Winter Quarter)

3.984 Spectroscopy and Interferometry

Prep. 3.983,
Classical Coherence Theory
(Offered yearly, Spring Quarter)

These two courses constitute the second optics elective sequence. They consist of a series of lectures on the classical theory of coherence and include application to spectrophotometric and interferometric instruments; the design, calibration and use of spectrophotometric and interferometric instruments; spectroscopy and metrology.

3.985 Fundamentals of Automatic Digital Machines I

Prep. 3.973,
Design Principles of Electronic
Digital Computers III, or equivalent

Study of theoretical models of computation; finite state machines; preparation of state diagrams; linear expressions; deterministic and non-deterministic machines; operations on sets of sentences, regular expressions; Turing machines; Digital representation of information.
(Offered 1969-70, Fall Quarter)

3.986 Fundamentals of Automatic Digital Machines II

Prep. 3.985,
Fundamentals of Automatic Digital Machines I

Principles of digital information processing systems with emphasis on the stored program synchronous computer. Description of digital systems, review of digital computer development; essential features of automatic programming; basic techniques for data manipulation, instruction formats and repertoires; elementary machines; special and general purpose computers; modular system organization.
(Offered 1969-70, Winter Quarter)

3.987 Fundamentals of Automatic Digital Machines III

Prep. 3.986,
Fundamentals of Automatic Digital Machines II

Logical properties of bivalued elements, combinatorial nets, minimization of logical functions, basic logical blocks, storage elements, combinatorial and

sequential circuits and arrays; Logical design of automatic digital processors; Current trends in system and logic design of Electronic Digital Systems.
(Offered 1969-70, Spring Quarter)

3.990 Seminar I Prep. Bachelor of Science degree
in Engineering or Science

A library survey of a selected topic in the general field of electrical engineering with an oral presentation based on this survey. Participation in the departmental seminar program of guest lecturers. (Offered yearly, Fall and Spring Quarters)

3.991 Seminar II Prep. 3.980, Seminar I

The preparation of a research paper suitable for publication in a professional journal, plus an oral presentation of this report.

(Offered yearly, Winter and Spring Quarters)

3.993 Doctoral Seminar I Prep. Passing of Ph.D. Qualifying Exam

Two hours per week of presentation and discussion of topics at a level compatible with a doctoral program. Subject matter may cover a wide range of scientific and engineering fields. (Only S or F grades will be assigned for this course.)
(Offered yearly, Fall Quarter)

3.994 Doctoral Seminar II Prep. 3.983, Doctoral Seminar I

Continuation of 3.983, Doctoral Seminar I. (Only S or F grades will be assigned for this course.)
(Offered yearly, Winter Quarter)

3.995 Master's Thesis Prep. Bachelor of Science degree
in Engineering or Science

Analytical and/or experimental work conducted under the auspices of the department.
(Offered yearly, Fall, Winter, and Spring Quarters)

3.996 Doctoral Thesis Prep. Passing of Ph.D. Qualifying Exam

Theoretical and/or experimental work conducted under the auspices of the department.
(Offered yearly, Fall, Winter, and Spring Quarters)

3.997 Doctoral Reading Prep. Passing of Ph.D. Qualifying Exam

Material approved by the candidate's adviser. (Only S or F grades will be assigned for this course.) (Offered yearly, Fall, Winter, and Spring Quarters)

3.998 Special Problems in Electrical Engineering Prep. Consent of
Dept. Chairman

Theoretical or experimental work under individual faculty supervision.
(Offered yearly, Fall, Winter, and Spring Quarters)

Industrial Engineering and Engineering Management

MASTER OF SCIENCE IN INDUSTRIAL ENGINEERING Full-Time Program on the Cooperative Plan

Admission

To be enrolled for graduate work leading to the degree of Master of Science in Industrial Engineering, applicants must have obtained a Bachelor of Science degree in some engineering field from a recognized institution. If the student has had no accounting, it will be necessary to take basic accounting as an elective.

Program

Forty quarter hours of academic work are required. This program may be taken on the Cooperative Plan. On this plan students take academic work in the Fall and Spring quarters of the first year and in the Winter quarter of the second year. The other three quarters of the two academic years and the Summer after the first year are available for professional employment.

A thesis of six quarter hours of credit is required. A faculty adviser will be appointed to approve the thesis topic and supervise its completion.

The sequence of courses on the Cooperative Plan will normally be taken according to the following pattern:

First Academic Quarter	Credits	Second Academic Quarter	Credits
5.823 Advanced Production Analysis	4	5.809 Advanced Engineering Economy	2
5.900 Basic Operations Research	4	5.824 Case Studies in Industrial Engineering	4
10.831 Probability	2	5.914 Advanced Operations Research	2
Elective	4	10.836 Mathematical Statistics	4
	<hr/> 14	Elective	2
			<hr/> 14
Third Academic Quarter		Credits	
5.990 Seminar	4		
5.991 Thesis	6		
Elective	2		
	<hr/> 12		

Students may also take the program on a continuous full-time basis to complete the degree requirements in one academic year. The sequence of courses on this plan is established with the chairman of the department.

Electives

With the approval of the adviser, a maximum of six quarter hours of credit may be elected from courses in the Graduate Division. Students who have had the equivalent of any of the required courses may petition to substitute electives.

MASTER OF SCIENCE IN ENGINEERING MANAGEMENT

Evening Part-Time Program

Admission

To be enrolled for graduate work in engineering management, applicants must have obtained a Bachelor of Science degree in an engineering field from a recognized institution. Consideration will be given to a limited number of applicants with a Bachelor of Science degree in related science or mathematics from a recognized institution whose preparation is considered adequate for this program. In such cases, additional required courses to strengthen deficient areas may be spec-

ified by the adviser. Students who have not had a basic course in accounting must take two quarter hours of credit work in accounting as an elective. Students who have not had a basic course or extensive experience in data processing (FORTRAN language) must take 5.913, Data Processing for Engineers, as an elective for degree credit.

Program

The program leading to the Master of Science in Engineering Management is designed for part-time students who may progress according to their abilities and the time available. The purpose of the program is to prepare engineers and scientists to expand their capabilities to assume managerial and supervisory responsibilities in technically oriented organizations. Forty quarter hours of work are required of which 18 quarter hours are specified as follows:

Required Courses		Credits
5.801	Analysis of the Industrial Enterprise I	2
5.802	Analysis of the Industrial Enterprise II	2
5.808	Basic Engineering Economy	2
5.830	Financial Management I	2
5.831	Financial Management II	2
5.901	Basic Operations Research I	2
5.902	Basic Operations Research II	2
5.950	Engineering Statistics I	2
5.951	Engineering Statistics II	2
		<hr/> 18

Students who have previously taken courses equivalent to 5.808, Engineering Economy, 5.901 and 5.902 Basic Operations Research or 5.950 and 5.951, Engineering Statistics should obtain approval of the adviser to petition to substitute advanced or applied courses in the same subject area.

Electives

All electives may be taken from the graduate courses offered in the Industrial Engineering Department but at least eight quarter hours must be within the department.

The remaining fourteen may be elected from any graduate courses in other engineering fields, in mathematics, or in science for which the student has the necessary preparation. Up to six of the fourteen may be elected from any course in the Graduate Division, subject to the approval of the Director of the Graduate School in which the course is offered.

Suggested Elective Sequences

Although no designated major fields are offered in the Engineering Management program, most students follow one of three broad areas of interest. The following comments are offered as a guide to course selection and are not to suggest required courses. It is hoped that students

will elect some broadening courses outside their specific field of interest. For additional information or advice on programs the student should apply to the Graduate School Office or to the program coordinator in the Industrial Engineering Department. Students should plan to take required and prerequisite courses early to assume flexibility of choice toward the end of their program. It should be noted that some electives are offered annually but alternately at the Boston and Suburban campuses. Others can only be offered at one campus.

Operations Research

The Operations Research sequence is followed by students interested in the mathematical aspects of solving problems of industry and government and the development or application of new quantitative techniques in this field. The fundamental courses would usually be:

5.903	Inventory Control
5.904	Queuing Theory
5.905	Analysis with Simulation
5.911	Linear Programming
5.952	Design of Experiments
5.953	Statistical Decision Theory

Other courses from which students may select to meet their interests include:

5.809	Advanced Engineering Economy
5.813	Engineering Reports
5.818	Management Information Systems
5.827	Basic Economics for Engineers
5.912	Network Planning and Control
5.916	Engineering Analysis Utilizing Data Processing
5.955	Reliability and Maintainability Applications
3.952 and 3.953	Systems Analysis III and IV
10.804 and 10.805	Advanced Mathematics
10.831 and 10.832	Probability
10.834 and 10.835	Mathematical Statistics
10.838 and 10.839	Stochastic Processes
10.871 and 10.872	Matrix Analysis

For students particularly interested in Industrial Dynamics, a sequence of three courses is offered for the first time in 1968–1969 as follows:

5.906	Introduction to Industrial Dynamics
5.907	Industrial Dynamics Project
5.908	Advanced Industrial Dynamics

Production Engineering

The Production Engineering sequence is suggested for students interested in the management or technical support of manufacturing operations. The fundamental courses for most such students would include:

- 5.805 Industrial Budgeting for Engineers
- 5.811 Cost Accounting for Engineers
- 5.817 Advanced Work Design
- 5.820 Personnel Administration for Engineers
- 5.827 Basic Economics for Engineers
- 5.903 Inventory Control and Production Planning
- 5.954 Advanced Quality Control
- 5.955 Reliability and Maintainability Applications
- 5.956 Mathematical Theory of Reliability
- 5.957 Designing for Reliability

Related courses which students may select in addition to meet their particular interest include:

- 5.806 Production Forecasting
- 5.809 Advanced Engineering Economy
- 5.814 Executive Development
- 5.816 Industrial Psychology for Engineers
- 5.818 Management Information Systems
- 5.819 Human Factors in Man-Machine Systems
- 5.822 Value Engineering

In addition, interested students should consult the catalog of the Graduate School of Business Administration for courses in such subjects as economics, labor relations or human relations.

Management of Technology

The Management of Technology sequence is suggested for students interested in research, development, testing and engineering programs in technical or government organizations including design of products, processes and equipment. The fundamental courses for these students would be:

- 5.805 Industrial Budgeting for Engineers
- 5.809 Advanced Engineering Economy
- 5.812 Management of Technical Innovation
- 5.815 Legal Aspects of New Technology
- 5.912 Network Planning and Control
- 5.917 Information Retrieval
- 5.952 Design of Experiments

Related courses of general interest in this area include:

- 5.813 Engineering Reports
- 5.816 Industrial Psychology for Engineers
- 5.820 Personnel Administration for Engineers
- 5.828 Industrial Marketing
- 5.905 Analysis with Simulation
- 5.953 Statistical Decision Theory

Those with interest in engineering design might select from the following courses:

- 5.819 Human Factors in Man-Machine Systems
- 5.822 Value Engineering
- 5.916 Engineering Analysis Utilizing Data Processing
- 5.954 Advanced Quality Control
- 5.955 Reliability and Maintainability Applications
- 5.956 Mathematical Theory of Reliability
- 5.957 Designing for Reliability

In addition, interested students should consult the catalog of the Graduate School of Business Administration for courses in such subjects as economics, business law and human relations.

DESCRIPTION OF COURSES

All courses carry two quarter hours of credit unless otherwise noted. Seminar and thesis may have varying credits established by the department at the time of registration.

5.801 Analysis of the Industrial Enterprise I Prep. Bachelor of Science degree in Engineering or Science

A background for the practicing engineer: review of the history and growth of industrial enterprises; examination of the principles and foundation for sound enterprises; modern organizational precepts and practices; management attitude and training; close look at the product, development of a new product, marketing, advertising, and selling in domestic and foreign markets; the effect of good public relations and corporate image on the success of the industrial enterprise. Open to Engineering Management majors only.

(Offered yearly, all quarters)

5.802 Analysis of the Industrial Enterprise II Prep. 5.801, Analysis of the Industrial Enterprise I

The importance of modern planning and forecasting techniques; the effect of cybernation on the employee and the enterprise; the financial aspects of the corporation, the stock market and the interpretation of financial and business news; modern economics and its effect on business, government and community; the interrelationships of government and business. (Offered yearly, all quarters)

5.805 Industrial Budgeting for Engineers Prep. 5.810, Industrial Accounting or equivalent

Budgeting plans, programs, and reports for industry today; an introduction to the essentials of fixed and variable budgeting for production, inventory, sales, cash, capital, and cost-volume-profit analysis.

(Offered yearly, Fall Quarter)

5.806 Production Forecasting Prep. 5.951, Engineering Statistics II

Methods of forecasting the production of goods and materials for the firm, industry and national economy; special emphasis on techniques applicable to individual companies and products; some attention given to forecast of the gross national product and its principal components.

(Offered yearly, Spring Quarter)

5.808 Basic Engineering Economy Prep. Bachelor of Science degree
in Engineering or Science

Economic analysis in formulating business policies and selecting alternatives from possible engineering solutions to industrial problems, present worth, annual cost and rate of return techniques with continuous and discrete interest calculations. Northeastern graduates who have completed 5.260, Engineering Economy, or 5.265, Fundamentals of Engineering Economy must substitute 5.809, Advanced Engineering Economy. (Offered yearly, all quarters)

5.809 Advanced Engineering Economy Prep. 5.808,
Basic Engineering Economy

Principal emphasis on the practical application of the techniques studied in 5.808, Basic Engineering Economy; problems of implementation through class discussion of cases and a major term project; recent advances in the techniques of engineering economy, especially those relating to the consideration of uncertainties. (Offered yearly, Winter and Spring Quarters)

5.810 Industrial Accounting for Engineers Prep. Bachelor of
Science degree in Engineering or Science

Required of all students who have not had a basic course in accounting. Introduction of basic accounting principles and procedures; use of accounting data as a management tool; a practical coverage of basic cost procedures related to materials, labor, and manufacturing expense cost control; job order, process and standard cost systems. Open to Engineering Management majors only. (Offered yearly, all quarters)

5.811 Cost Accounting for Engineers Prep. 5.810, Industrial Accounting

Cost accounting procedures as established by accountants are studied and evaluated in terms of being considered by the engineer for cost determination of alternative engineering proposals. (Offered yearly, Winter Quarter)

5.812 Management of Technical Innovation Prep. Bachelor of Science
degree in Engineering or Science

Analysis of the particular problems of managing research, development and engineering based on current developments in general management theory and the behavioral sciences; technical innovation as part of the overall organization; selection, administration and evaluation of projects. (Offered yearly, Fall and Winter Quarters)

5.813 Engineering Reports Prep. Bachelor of Science degree
in Engineering or Science

Principles for achieving a clear, readable style through appropriate word choice and modern concepts of sentence and paragraph structure; application and evaluation of these principles in engineering proposals, reports, manuals, and related documents; practice in utilizing artwork, setting up outlines, and adapting to various reader levels; class analysis of great engineering literature. (Offered yearly, all quarters)

5.814 Development of Engineering Managers Prep. 5.802, Analysis
of the Industrial Enterprise II

Analysis of the problems faced by the engineer in the transition from individual contributor to engineering manager; the challenge of engineering management; analyzing what is their business and who are their customers; integrating

profession and management objectives; developing guides for engineering managers, enabling them to examine their own work and performance, to diagnose their weaknesses and to improve their effectiveness as well as the results of the enterprise. (Offered yearly, Fall and Winter Quarters)

5.815 Legal Aspects of New Technology Prep. Bachelor of Science degree in Engineering or Science

The relationship of laws and regulations to technical innovation and related corporate activities; emphasis on the patent and copyright systems; trade secrets; managing intellectual property as part of employer-employee relations; disposition of rights under federal contracts and grants.

(Offered yearly, Fall and Spring Quarters)

5.816 Industrial Psychology for Engineers Prep. Bachelor of Science degree in Engineering or Science

A general coverage of the application of psychology to industry with emphasis on industrial environments and organization, human relations, group dynamics, tests and measurements, personnel practices, training, and motivation.

(Offered yearly, all quarters)

5.817 Advanced Work Design Prep. A work measurement course

Basic philosophies of work design; implementation of work design concepts with case studies; study and analysis of models such as work sampling, sequence or flow of work models, repetitive and nonrepetitive work models; and work measurement models such as standard data; human factors in measuring operator performance; regression analysis approaches.

(Offered yearly, Winter Quarter)

5.818 Management Information Systems Prep. 5.810, Industrial

Accounting and 5.913, Data Processing for Engineers or their equivalent Design and critique of industrial information systems for management decision-making with emphasis on the use of electronic computers; case method used to provide a realistic environment for study of actual information system needs and techniques; examples developed in budgeting and accounting, scheduling, forecasting, inventory and production control systems; introduction to application of analytical techniques such as mathematical and simulation models.

(Offered yearly, Fall and Spring Quarters)

5.819 Human Factors in Man-Machine Systems Prep. Bachelor of Science degree in Engineering or Science

Design of equipment and systems for human use; emphasis on the application of engineering psychology; visual and auditory presentation of information, speech communications, man-machine dynamics, design of controls, layout of work places and environmental effects on human performance.

(Offered yearly, Fall and Spring Quarters)

5.820 Personnel Administration for Engineers Prep. Bachelor of Science degree in Engineering or Science

Personnel programs for attracting and retaining technical talent; evaluating effectiveness of major personnel policies; modern methods of salary and wage administration; planning profitable relationships among company, supervisors and employees.

(Offered yearly, Winter and Spring Quarters)

5.822 Value Engineering Prep. Bachelor of Science degree in Engineering or Science
Value analysis from point of view of design, manufacturability, procurement and installation, complete value analysis study, value tests, function-cost relationship, principles and procedures to optimize value in products.
(Offered yearly, Winter and Spring Quarters)

5.823 Advanced Production Analysis Prep. Bachelor of Science degree in Engineering or Science
A review of the classical techniques used in industrial engineering, investigation into refinements and extensions of these techniques in production as well as in other activities not typically associated with industrial engineering.
4 Q.H. credits. (Offered yearly, days only, Fall Quarter)

5.824 Case Studies in Industrial Engineering Prep. 5.823, Advanced Production Analysis
Case studies of successful and unsuccessful engineering analyses utilizing industrial engineering techniques; qualitative and quantitative techniques are used based on their suitability to the particular problem involved; some consideration of computer techniques in industrial engineering studies.
4 Q.H. credits. (Offered yearly, days only, Spring Quarter)

5.827 Basic Economics for Engineers Prep. Bachelor of Science degree in Engineering or Science
Development of macro-economic analysis; review of national income accounting and concepts; national income determination, fluctuation, and growth; contraction and expansion analyzed through the circular flow of money payments; role of the banking system and the Federal Reserve system; government expenditures and taxation; international trade: balance of international payments, law of comparative advantage, tariff protection versus free trade.
(Offered yearly, Winter Quarter)

5.828 Industrial Marketing Prep. Bachelor of Science degree in Engineering or Science
Introduction to managerial problems in marketing operations, emphasizing possibilities of gaining insight into the underlying determinants and dynamics of consumer and industrial demand behavior through the medium of social and economic research; basic policy considerations through which marketing management may adapt operations of firm to changing market environment; selection and control of channels of distribution, product line, pricing and sales promotion policy; theoretical concepts and quantitative techniques applied in study of marketing phenomena.
(Offered yearly, Winter Quarter)

5.830 Financial Management I Prep. 5.802, Analysis of the Industrial Enterprise II, and 5.810, Industrial Accounting for Engineers or equivalent
Study of the issues and processes of short-term financing of industrial firms; financial analysis of cases, supplemented by readings to develop familiarity with sources and uses of working capital as well as the goals and problems involved in its management. Open to Engineering Management majors only.
(Offered yearly, all quarters)

5.831 Financial Management II Prep. 5.830, Financial Management I
 Extension of Financial Management I with emphasis on analysis necessary to such long-term financial decisions as issuance of stock or bonds; contracting of leases or loans, and financing of a new enterprise; mergers, capital budgeting, the cost of capital, and the valuation of a business.

(Offered yearly, all quarters)

5.840 Seminar on Management of Engineers Prep. 5.812 or 5.816
 or 5.820

(Limited to 15 students selected from preregistration applications)

Each student will prepare a term project on a subject of his choosing to be presented orally and in writing; discussions of major problem areas led by instructor and guest speakers.

(Offered yearly, Spring Quarter)

5.900 Basic Operations Research Prep. 5.951, Engineering Statistics II
 or 10.831, Probability

An introduction to the theory and use of deterministic and stochastic models to represent industrial operations. Models included are those of linear programming, dynamic programming, inventory control, waiting lines and Monte Carlo simulation.

4 Q.H. credits.

(Offered yearly, day only, Fall Quarter)

5.901 Basic Operations Research I Prep. 5.951, Engineering Statistics II
 Evening equivalent to first half of 5.900, Basic Operations Research. Open to Engineering Management majors only.

(Offered yearly, all quarters)

5.902 Basic Operations Research II Prep. 5.901,
 Basic Operations Research

Evening equivalent to second half of 5.900, Basic Operations Research.

(Offered yearly, all quarters)

5.903 Inventory Control and Production Planning Prep. 5.951
 Engineering Statistics II or equivalent

The design and operation of inventory systems from a scientific management point of view, including both required theory and practical aspects. Subjects include inventory control models, statistical forecasting, production scheduling techniques, distribution systems, management control and reports, discussion of actual systems and a case study.

(Offered yearly, Spring Quarter)

5.904 Queuing Theory and Its Applications Prep. 5.900 or 5.902,
 Basic Operations Research or equivalent

A development of the theory of queues using the equations of detailed balance approach; study of models based on random arrivals including exponential and Erland service distributions, single and multiple services, series and parallel systems, and finite and infinite queues, applications to staffing inventory control, maintenance, and scheduling.

(Offered yearly, Winter Quarter)

5.905 Analysis with Simulation Prep. 5.913, Data Processing for
 Engineers or equivalent

Model building for digital simulation, testing and validation of models, simulation compiler languages, logic flow charting, applications drawn from economics scheduling, inventory problems, marketing and others.

(Offered yearly, Fall Quarter)

5.906 Introduction to Industrial Dynamics

Prep. Bachelor of Science
degree in Engineering or Science

Managerial decisions which affect cash, employees, inventories, quality, marketing and R & D effort are viewed as parts of an interrelated information feedback control process which results in the growth, oscillation, or stagnation of important variables such as profit; the industrial dynamics procedures which use feedback control theory and DYNAMO simulation for the quantitative analysis of such processes are presented in class and used in a term project.

(Offered yearly, Fall Quarter)

5.907 Industrial Dynamics Project

Prep. 5.906, Introduction to
Industrial Dynamics

The introductory industrial dynamics material is reviewed and extended to consider complex delay functions, discrete events, forecasting and other non-linear functions in preparation for a major term project. The project objective is the implementation of recommendations based on an in-depth industrial dynamics study of a system with which the student is closely associated. The time shared computer will be used.

(Offered yearly, Winter Quarter)

5.908 Advanced Industrial Dynamics

Prep. 5.906, Introduction to
Industrial Dynamics

The industrial dynamics analysis procedure from initial objective setting to final evaluation is considered as a feedback process in itself and as an integral part of the feedback system under study. The generality of the feedback concept is explored in a field of the student's choosing (examples are engineering, military activities, meteorology, medicine, politics, and city planning). The time shared computer will be used.

(Offered yearly, Spring Quarter)

5.911 Linear Programming

Prep. 5.900, or 5.902, Basic
Operations Research or equivalent

Covers in depth techniques and theory contained in linear, quadratic, and nonlinear programming which would include sensitivity analysis, the dual theorem, parametric programming, and problems involving uncertainty.

(Offered yearly, Spring Quarter)

5.912 Network Planning and Control

Prep. 5.913, Data
Processing for Engineers or equivalent

Applications of the theory of flow through networks to scheduling, planning, line balancing, transportation and materials handling; PERT and Critical Path Scheduling; case studies of successful and unsuccessful applications; computer and manual solutions utilized.

(Offered yearly, Spring Quarter)

5.913 Data Processing for Engineers

Prep. Bachelor of Science
degree in Engineering or Science

Required of all students who have not had a basic course or extensive experience in FORTRAN language. A study of digital computers and computer programming techniques as applied to management problems. The course will cover the basic characteristics and operation of computing equipment and peripheral devices. The FORTRAN language is presented in depth and will be utilized by the student for programming and running several projects on a computer. Other compiler languages will be described and compared to FORTRAN.

A systems approach to the design, development, and implementation of computer programs for solving management problems will be emphasized. Examples will be studied from several management areas.

(Offered yearly, all quarters)

5.914 Advanced Operations Research

Prep. 5.900, Basic Operations Research

Further study of quantitative techniques available to assist management in scientific decision-making, including Markov processes, utility theory, Bayesian statistics, and forecasting; case studies of real industrial problems.

(Offered yearly, day only, Spring Quarter)

5.916 Engineering Analysis Utilizing Data Processing

Prep. 5.913,

Data Processing for Engineers or equivalent

Engineering and quantitative management problems utilizing data processing equipment; problem formulation and adaptation to digital and/or analog equipment; case studies and a trip to an engineering applications computer installation.

(Offered yearly, Fall Quarter)

5.917 Information Retrieval Techniques

Prep. 5.913, Data Processing for Engineers or equivalent

Fundamental aspects of information retrieval concepts, techniques, equipment and systems; subject analysis, classification, indexing, coding, storage search and retrieval; vocabulary control and thesaurus development; manual microfilm and digital computer applications; system evaluation; user requirements, operating personnel and implementation problems; future trends.

(Offered yearly Fall Quarter)

5.920 Computer Utility Systems

Prep. 5.913, Data Processing for Engineers or equivalent

The concepts and possible applications of computer networks providing on-line service to many users with widely different information processing service and capability needs; hardware and software considerations; cost and economic considerations; legal and security problems; reliability; evaluation for management decision or use; case histories.

(Offered yearly, Fall Quarter)

5.950 Engineering Statistics I

Prep. Bachelor of Science degree in Engineering or Science

A brief though rigorous introduction to probability as foundation for statistics; discrete and continuous distributions such as foundation for statistics: discrete and continuous distributions such as the binomial, Poisson, hypergeometric and normal; mean and variance; operations research; sampling distributions. Open to Engineering Management majors only.

(Offered yearly, all quarters)

5.951 Engineering Statistics II

Prep. 5.950, Engineering Statistics I

An introduction to the techniques of statistical inference, treatment of statistical data, inferences concerning means, variances and proportions, regression analysis, correlation and other statistical concepts.

(Offered yearly, all quarters)

5.952 Design of Experiments

Prep. 5.951, Engineering Statistics II or 10.836, Mathematical Statistics or equivalent

Use and analysis of experimental designs such as randomized blocks and

Latin squares; analysis of variance and covariance; factorial experiments; statistical problems associated with finding best operating conditions; response surface analysis.
(Offered yearly, Fall Quarter)

5.953 Statistical Decision Theory Prep. 5.951, Engineering Statistics II or 10.831, Probability or equivalent
Use of Bayesian statistical inference to arrive at decisions when stochastic variables are interacting; relationship to Game Theory; decision making over time in a sequence; important expected values and distributions; relationship of Bayesian decision theory to classical statistical inference.
(Offered yearly, Fall Quarter)

5.954 Advanced Quality Control Prep. 5.951, Engineering Statistics II or equivalent
Economics of quality, specification of quality, organization for quality, statistical methods of quality control; quality policies and objectives; personnel methods for quality; design of testing and inspection procedures; budgeting of quality programs; sampling by variables, sampling for life testing, continuous sampling.
(Offered yearly, Winter Quarter)

5.955 Reliability and Maintainability Applications Prep. 5.951, Engineering Statistics II or 10.831, Probability or equivalent
An introduction to reliability and maintainability engineering technology applied to system and circuit design; the "bath-tub" curve; stress de-rating of components; failure rate and repair rate prediction techniques and assessment; early failure, useful life and wearout characteristics.
(Offered yearly, Fall Quarter)

5.956 Mathematical Theory of Reliability Prep. 5.955, Reliability and Maintainability Applications
Probability mathematical techniques utilized in systems reliability analysis; prediction; allocation and demonstration testing; reliability probability functions, active and standby redundancy with or without repair, spares planning, and availability.
(Offered yearly, Winter Quarter)

5.957 Designing for Reliability Prep. 5.955, Reliability and Maintainability Applications
Oriented to the design of electronic systems; development of complex system reliability mathematical models; Markovian chain stochastic processes, matrix algebra applied to redundancy problems; flow-diagram techniques using Laplacian transforms, and queuing theory for repairable systems; system-effectiveness methods particularly those developed by Hunter and Barlow.
(Offered yearly, Spring Quarter)

5.990 Seminar Prep. 5.823, Advanced Production Analysis
Capstone seminar to integrate graduate level courses; periodic distinguished outside speakers; graduate student and faculty presentation of research papers.
4 Q.H. credits.
(Offered yearly, day only, Winter Quarter)

5.991 Thesis (Master's Degree) Prep. Bachelor of Science degree in Engineering or Science
Analytical and/or experimental work conducted under the auspices of the department.
6 Q.H. credits.
(Offered yearly, all quarters)

Mechanical Engineering

Admission

To be enrolled for graduate work leading to the degree of Master of Science in Mechanical Engineering, applicants must have obtained a Bachelor of Science degree in Mechanical Engineering from a recognized institution. Applicants with a bachelor's degree in other engineering or related science fields and an appropriate background of preparation may pursue this program and qualify for the degree of Master of Science without specification.

THE MASTER'S DEGREE

Full-Time Program on the Cooperative Plan

Forty quarter hours of academic work are required. This program may be taken on the Cooperative Plan. On this plan, students take academic work in the Fall and Spring quarters of the first year and in the Winter quarter of the second year. The other three quarters of the two academic years and the summer after the first year are available for professional employment.

A thesis of ten quarter hours of credit is required unless waived by the department graduate committee.

Majors in Mechanics, Materials and Heat are available. The sequence of courses on the Cooperative Plan will normally be taken according to the following pattern:

MECHANICS MAJOR

First Academic Quarter	Credits	Second Academic Quarter	Credits
2.803 Continuum Mechanics	4	2.990 Seminar	1
2.862 Systems Engineering .	4	2.991 Thesis	5
10.803 or		Electives	8
10.806 Advanced			14
Mathematics	4		
	12		

Third Academic Quarter	Credits
2.990 Seminar	1
2.991 Thesis	5
Electives	8
	<hr/> 14

MATERIALS MAJOR

First Academic Quarter	Credits	Second Academic Quarter	Credits
2.803 Continuum Mechanics	4	2.955 Advanced Physical Metallurgy A	4
10.803 or		2.990 Seminar	1
10.806 Advanced Mathematics	4	2.991 Thesis	5
2.232 Physical Metallurgy or Electives	4	Electives	4
	<hr/> 12		<hr/> 14

Third Academic Quarter	Credits
2.990 Seminar	1
2.991 Thesis	5
Electives	8
	<hr/> 14

HEAT MAJOR

First Academic Quarter	Credits	Second Academic Quarter	Credits
2.803 Continuum Mechanics	4	2.912 Heat Transfer	4
2.903 Advanced Thermodynamics	4	2.990 Seminar	1
10.803 or		2.991 Thesis	5
10.806 Advanced Mathematics	4	Electives	4
	<hr/> 12		<hr/> 14

Third Academic Quarter	Credits
2.990 Seminar	1
2.991 Thesis	5
Electives	8
	<hr/> 14

Students may also take the program on a continuous full-time basis to complete the degree requirements in one academic year. The sequence of courses which students take on this plan is established by their adviser.

Electives

With the approval of the adviser, a maximum of ten quarter hours of credit may be elected from graduate courses in other departments.

PART-TIME EVENING PROGRAMS

The admission requirements for these programs are the same as for the full-time program, but students may progress according to their abilities and the time available.

REQUIRED COURSES

Mechanics Major	Credits	Materials Major	Credits
10.801 or		10.801 or	
10.804 Advanced		10.804 Advanced	
Mathematics	2	Mathematics	2
10.802 or		10.802 or	
10.805 Advanced		10.805 Advanced	
Mathematics	2	Mathematics	2
2.801 Continuum Mechanics	2	2.801 Continuum Mechanics	2
2.802 Continuum Mechanics	2	2.802 Continuum Mechanics	2
2.860 Systems Engineering .	2	2.950 Physical	
2.861 Systems Engineering .	2	Metallurgy I	2
	<hr/>	2.951 Physical	
	12	Metallurgy II	2
		2.952 Physical	
		Metallurgy III	2
		2.953 Advanced Physical	
		Metallurgy	2
			<hr/>
			16

Heat Major	Credits
10.801 or	
10.804 Advanced	
Mathematics	2
10.802 or	
10.805 Advanced	
Mathematics	2
2.801 Continuum Mechanics	2
2.802 Continuum Mechanics	2
2.901 Advanced	
Thermodynamics	2
2.902 Advanced	
Thermodynamics	2
2.910 Heat Transfer	2
2.911 Heat Transfer	2
	<hr/>
	16

Electives

Thirty of the 40 quarter hours must be from mechanical engineering courses.

The remaining ten may be elected from any courses in engineering or science for which the student has the necessary preparation.

THE DOCTOR'S DEGREE

The following material outlines the procedure for admission to the doctoral program and the steps necessary to qualify for the Ph.D. degree. For further information, applicants should write to the Chairman of the Department of Mechanical Engineering.

Admission

Applicants who are enrolled as candidates for the degree of Master of Science in Mechanical Engineering at Northeastern University should apply in writing to the Chairman of the Department of Mechanical Engineering for admission to the doctoral program. Such application must be made by February first of the year in which they expect to receive the Master's degree. The Departmental Graduate Committee will examine the record of the applicant and decide whether or not he should be allowed to take the qualifying examination.

Applicants who are enrolled for graduate work at other institutions or who have completed the requirements for the Master's degree should write the Chairman of the Department for an application for an interview. This form, transcripts of all undergraduate and graduate work, together with three letters of recommendation must be transmitted to the Chairman of the Departmental Graduate Committee. The applicant will be notified of an interview time and, after the interview, will be advised if he will be invited to take the qualifying examination and if he should make formal application for admission to the doctoral program. The application for interview, transcripts, and letters of recommendation must be received by February first if the April qualifying examination is to be taken.

Residence Requirement

After degree candidacy has been established, the residence requirement is satisfied by one year of full-time graduate work or by two years of half-time graduate work. However, a student should expect to spend at least two years, or the equivalent, in full-time graduate study beyond the requirements of the Master's degree.

Degree Candidacy

Degree candidacy is established in accordance with the general Graduate Division regulations.

Qualifying Examination

The qualifying examination in the Department of Mechanical Engineering is offered yearly in April. This examination consists of two three-hour written parts and three three-quarter hour oral parts. The written parts may be either open book or closed book at the discretion of the Committee. Areas covered by the written examination are as follows:

1. Thermodynamics and Heat Transfer
2. Mechanics, Solid and Fluid
3. Machine Design
4. Materials and Processing

The oral parts of the qualifying examination are designed to test the applicant's grasp of the fundamentals of thermodynamics and mechanics, and his knowledge of the use and behavior of engineering materials.

The qualifying examination may be taken by a graduate student who expects to complete the requirements for his Master's degree within three months of the date of the qualifying examination as well as by a person who has already completed the requirements for the Master's degree. If the examination is failed, it may be repeated only once with permission of the Departmental Graduate Committee.

Comprehensive Examination

The comprehensive examination is combined with the final oral examination and is given after the thesis has been completed and approved. This examination is based upon the subject matter and defense of the thesis.

Course Requirements

Course requirements for each applicant will be determined by the Departmental Graduate Committee. Formal course work will be tailored to meet the individual student's objectives. A maximum of ten quarter-hour course credits may be taken before satisfactory completion of the qualifying examination.

Thesis

After degree candidacy has been established, a candidate must complete a thesis which embodies the results of extended research and includes material suitable for publication.

The Departmental Graduate Committee may require the completion of certain course work before permitting thesis work to commence. A thesis committee will be appointed by the Chairman of the Department upon the recommendation of the Departmental Graduate Committee. The thesis committee will be kept informed of the progress of the thesis and will be responsible for initial approval of the thesis in its final form.

Foreign Language

A reading knowledge of two foreign languages is required. Proficiency in a language shall be determined in a manner prescribed by the Departmental Graduate Committee. The language requirement must be satisfied no later than one year before the time at which the degree is to be conferred.

Final Oral Examination

This requirement is held in accordance with the general Graduate Division requirements.

DESCRIPTION OF COURSES

The following undergraduate courses which are given in the daytime, may be elected by graduate students for graduate credit.

2.214 Experimental Stress Analysis

Prep. Admission to the
Engineering Graduate Program

This course, offered to day students, embodies the material in 2.817, Strain Gauge Techniques and 2.818, Photoelasticity.

4 Q.H. credits. (Offered 1968-69, Spring Quarter)

2.232 Physical Metallurgy

Prep. Admission to the
Engineering Graduate Program

Offered to day students. Embodies the material in 2.950 and 2.951, Physical Metallurgy I and II.

4 Q.H. credits. (Offered 1968-69, Fall and Spring Quarters)

The following are graduate courses which carry two quarter hours of credit unless otherwise noted. Courses carrying four quarter hours of credit are day courses. Seminar and thesis may have varying credits established by the department at the time of registration.

2.801 Continuum Mechanics

Prep. 10.802 or 10.804, Advanced
Mathematics or equivalent

Algebra and Calculus of Cartesian tensors, relation to vector analysis, curvilinear co-ordinates, stress in a continuum. (Offered 1968-69, all quarters)

2.802 Continuum Mechanics

Prep. 2.801, Continuum Mechanics

Strain and Strain Rate in a continuum, governing equations for an elastic solid and a Newtonian Fluid. Some exact solutions. (Offered 1968-69, all quarters)

2.803 Continuum Mechanics

Prep. 10.803 or 10.806, Advanced
Mathematics or equivalent

This course, offered to day students, embodies the material in 2.801 and 2.802, Continuum Mechanics.

4 Q.H. credits. (Offered 1968-69, Fall Quarter)

2.805 Theory of Elasticity

Prep. 2.802, Continuum Mechanics

Stress and deformation analysis of elastic solids. Two-dimensional problems; stress concentration; thermal stress. Theory of torsion, prismatic and axial symmetric bars. Introduction to the theory of plates, bending of thin plates.

(Offered 1968-69, Winter Quarter)

2.806 Theory of Elasticity

Prep. 2.805, Theory of Elasticity

Method of finite differences. Numerical solutions; torsion problem; plate bending. Variational method and energy principles; minimum potential and complementary energy theorems. Introduction to dynamics of elastic solids; waves, vibrations.

(Offered 1968-69, Spring Quarter)

2.807 Theory of Elasticity

Prep. 2.803, Continuum Mechanics

This course, offered to day students, embodies the material in 2.805 and 2.806, Theory of Elasticity.

4 Q.H. credits.

(Offered 1968-69, Winter Quarter)

2.809 Plasticity and Creep

Prep. 2.950 and 2.951,

Physical Metallurgy I and II

Types of deformation, elasticity, plasticity, creep, mechanical equation of state, plastic flow under multi-axial stress, and elastic creep. Relationship of comparatively simple laboratory material tests to more complex service conditions will be emphasized.

(Offered 1969-70, Spring Quarter)

2.810 Advanced Mechanics of Materials I

Prep. Admission to

Engineering Graduate Program

Review of fundamental stress concepts; point stress and strain; differential equations of stress; elastic properties; theories of failure; transverse bending; shear stress distribution; shear center; bending stresses due to non-symmetrical bending.

(Offered 1968-69, Fall Quarter)

2.811 Advanced Mechanics of Materials II

Prep. 2.810, Advanced

Mechanics of Materials I

Thick and thin cylinders under elastic and plastic deformation; analysis of statistically indeterminate beams and frames by slope, deflection and moment distribution techniques; stresses in curved beams, beams on elastic foundations.

(Offered 1968-69, Winter Quarter)

2.812 Advanced Mechanics of Materials

Prep. Admission to

Engineering Graduate Program

This course, offered to day students, embodies the material in 2.810 and 2.811, Advanced Mechanics of Materials I and II.

4 Q.H. credits.

(Offered 1968-69, Winter Quarter)

2.813 Advanced Mechanics of Materials III

Prep. 2.811, Advanced

Mechanics of Materials II

Bending of flat plates; stability analysis of structural members; grid systems and other special topics to be selected by needs of the class.

(Offered 1968-69, Spring Quarter)

2.815 Plates and Shells

Bending of plates with various shapes, loads, and supports. Large deflection of plates. Membrane theory of shells. Analysis of cylindrical shells. General theory of thin elastic shells. Shells of revolution. (Offered 1968-69, Fall Quarter)

2.817 Strain Gauge Techniques

Prep. Admission to Engineering Graduate Program
Theory and application of mechanical and electrical strain gauges. Installation, instrumentation and circuitry of gauge set-ups or transducer use and experimental stress analysis. Use of brittle coatings in experimental stress analysis. (Offered 1969-70, Fall Quarter)

2.818 Photoelasticity

Prep. 2.817, Strain Gauge Techniques
Theory and practice of photoelastic methods as applied to classical experimental stress analysis of models and as modified for use in photoelastic coatings. (Offered 1969-70, Winter Quarter)

2.820 Fluid Dynamics

Prep. 2.802, Continuum Mechanics
Vorticity and circulation. Kelvin and Helmholtz theorems. Potentials and stream functions; Biot-Savart Law. Bernoulli relations. Complex variable theory applied to the solution of potential flows. Theorems of Blasius and Kutta-Joukowski. (Offered 1969-70, Fall Quarter)

2.821 Fluid Dynamics

Prep. 2.820, Fluid Dynamics
Surface waves and conditions at an interface. Some exact solutions of the Navier-Stokes equations. Stokes flow. Fundamentals of boundary layer theory; separation. Introduction to turbulence and stability. (Offered 1969-70, Winter Quarter)

2.822 Fluid Dynamics

Prep. 2.803, Continuum Mechanics
This course, offered to day students, embodies the material in 2.820 and 2.821, Fluid Dynamics. 4 Q.H. credits. (Offered 1968-69, Spring Quarter)

2.823 Gas Dynamics

Prep. 2.821, Fluid Dynamics
Sound speed in a gas. Shock waves. Characteristics. One and two dimensional steady flows. One-dimensional unsteady flow. Small perturbation theory. Similarity rules, Hodograph methods. (Not offered 1968-69)

2.824 Gas Dynamics

Prep. 2.823, Gas Dynamics
Continuation of 2.823, Gas Dynamics. (Not offered 1968-69)

2.825 Gas Dynamics

Prep. 2.822, Fluid Dynamics
This course, offered to day students, embodies the material in 2.823 and 2.824, Gas Dynamics. 4 Q.H. credits. (Offered 1968-69, Winter Quarter)

2.830 Orbital and Ballistic Mechanics

Prep. Admission to the Engineering Graduate Program
Orbit mechanics, dealing with the two body problem of unpowered coasting flights, orbital transfers, staging theory. (Offered 1968-69, Fall Quarter)

- 2.831 Orbital and Ballistic Mechanics** Prep. 2.830, Orbital and Ballistic Mechanics
Analysis of orbits aimed at specific missions such as Lunar, Venus and Mars — One and two-way trips. (Offered 1968-69, Winter Quarter)
- 2.832 Orbital and Ballistic Mechanics** Prep. Admission to the Engineering Graduate Program
This course, offered to day students, embodies the material in 2.830 and 2.831, Orbital and Ballistic Mechanics.
4 Q.H. credits. (Not offered 1968-69)
- 2.834 Dynamics of Re-entry Vehicles** Prep. 2.830, Orbital and Ballistic Mechanics or equivalent
Rigid vehicle kinematics, basic vehicle dynamics, definition and transformation of various axes systems associated with the vehicle motion, re-entry aerodynamic forces and heating, approximate solutions of entry dynamics, applications of fundamental theory to industrial problems on re-entry vehicle dynamics. (Offered 1968-69, Winter Quarter)
- 2.835 Advanced Dynamics of Re-entry Vehicles** Prep. 2.834, Dynamics of Re-entry Vehicles
Continuation of 2.834, Dynamics of Re-entry Vehicles. (Offered 1968-69, Spring Quarter)
- 2.836 Dynamics and Advanced Dynamics of Re-entry Vehicles** Prep. 2.832, Orbital and Ballistic Mechanics
This course, offered to day students, embodies the material in 2.834, Dynamics of Re-entry Vehicles and 2.835, Advanced Dynamics of Re-entry Vehicles.
4 Q.H. credits. (Not offered 1968-69)
- 2.837 Special Topics: Orbital and Ballistic Mechanics** Prep. 2.831, Orbital and Ballistic Mechanics
Low thrust vehicle analysis with emphasis on optimization, transfer between orbits, boost analysis. (Offered 1968-69, Spring Quarter)
- 2.842 Vibration Theory and Applications** Prep. 2.861, Systems Engineering
Multiple degrees of freedom; free and forced vibrations with or without damping, extensional and torsional oscillation, frequency equation, energy in a vibrating system, energy methods of solution, Rayleigh's Method. (Offered 1969-70, Fall Quarter)
- 2.843 Vibration Theory and Applications** Prep. 2.842, Vibration Theory and Applications
Continuation of 2.842 including systems with distributed mass and stiffness, shock and impact, balancing of rotating machinery, vibrations of beams and related structures. (Offered 1968-69, Fall Quarter)
- 2.844 Vibration Theory and Applications** Prep. 2.862, Systems Engineering
This course, offered to day students, embodies material in 2.842 and 2.843, Vibration Theory and Applications.
4 Q.H. credits. (Offered 1968-69, Spring Quarter)

2.845 Shock, Vibration and Noise Control

Prep. 2.843, Vibration
Theory and Applications

Theoretical and practical considerations pertinent to the design and protection of structures and equipment subject to severe environments of transient shock, steady state vibration, random vibration, and acoustic noise.

(Not offered 1968-69)

2.846 Non-Linear Vibrations

Prep. 2.843, Vibration
Theory and Applications

Studies of various non-linear problems and the techniques used in solving them. Symmetrical and unsymmetrical systems. The Van der Pol-Kryloff-Bogoliuboff method as well as others will be discussed. (Offered 1968-69, Spring Quarter)

2.847 Advanced Dynamics

Prep. Admission to the
Engineering Graduate Program

Application of fundamental laws of motion. Dynamics of a particle, motion of a projectile, linear and angular momentum, impact, kinetic energy and work. Variable and constant mass systems. Vector notation is used.

(Offered 1968-69, Spring Quarter)

2.848 Advanced Dynamics

Prep. 2.847, Advanced Dynamics

Continuation of 2.847, Advanced Dynamics, includes Hamilton's Principle, Euler's Equation, rotation of a rigid body, gyroscopes, and dynamic problems using analog computer. (Offered 1969-70, Fall Quarter)

2.849 Advanced Dynamics

Prep. Admission to the
Engineering Graduate Program

This course, offered to day students, embodies the material in 2.847 and 2.848, Advanced Dynamics.

4 Q.H. credits.

(Offered 1968-69, Winter Quarter)

2.850 Automatic Control Engineering

Prep. 2.861, Systems Engineering

Basic methods for analyzing and designing linear feedback control systems. Formulation of transfer functions and block diagrams representing physical components and systems. Study of control action. Analysis and design by use of root-locus and frequency-domain techniques.

(Offered 1968-69, Winter Quarter)

2.851 Automatic Control Engineering

Prep. 2.850, Automatic
Control Engineering

General theory of automatic control. Further consideration of linear systems including compensating methods and multiple-inputs. Techniques for the treatment of non-linear systems. Study of the details of components such as hydraulic and pneumatic servo valves, pneumatic power amplifiers, etc.

(Offered 1968-69, Spring Quarter)

2.852 Automatic Control Engineering

Prep. 2.862, Systems Engineering

This course, offered to day students, embodies the material in 2.850 and 2.851, Automatic Control Engineering.

4 Q.H. credits.

(Offered 1968-69, Spring Quarter)

2.853 Fundamentals of Instrumentation

Prep. Bachelor of
Science Degree

Theoretical principles underlying the design and operation of instruments for measurement and/or control. Analysis of stimulus-response relations. Industrial instruments for measurement and control, including those based on pneumatic and electrical systems.
(Offered 1968-69, Spring Quarter)

2.854 Industrial Process Control

Prep. 2.853, Fundamentals
of Instrumentation

Fundamental principles involved in automatic control of industrial processes. Economic considerations. Application of control instruments to obtain automatic control of temperature, pressure, fluid flow, liquid level, humidity, pH.
(Offered 1969-70, Fall Quarter)

2.860 Systems Engineering

Prep. Admission to
Engineering Graduate Program

The modeling and analysis of physical systems. Vibration of mechanical systems with one degree of freedom including the free-body and energy methods of formulating the equations of motion. Free vibration of undamped multi-degree-of-freedom systems; influence coefficients; matrix notation and iteration. Mechanical network or mobility-diagram representations; block diagramming. Laplace transform techniques.
(Offered 1968-69, all quarters)

2.861 Systems Engineering

Prep. 2.860, Systems Engineering

Continuation of 2.860. Transient analysis. Analog computation. Frequency response techniques.
(Offered 1968-69, all quarters)

2.862 Systems Engineering

Prep. Admission to
Engineering Graduate Program

This course, offered to day students, embodies the material in 2.860 and 2.861, Systems Engineering.

4 Q.H. credits.

(Offered 1968-69, Fall Quarter)

2.901 Advanced Thermodynamics

Prep. Admission to
Engineering Graduate Program

A critical examination of equilibrium thermodynamics from a rigorous viewpoint emphasizing fundamental concepts including; equilibrium, heat and work; the first and second law of thermodynamics; energy; heat engines, simple systems and open systems.
(Offered 1968-69, Fall Quarter)

2.902 Advanced Thermodynamics

Prep. 2.901, Advanced Thermodynamics

Continuation of 2.901 — including examination of temperature scales; entropy and availability; the phase rule, single component systems; thermodynamic relations. Consideration is also given to the ideal gas; chemical potential and thermodynamics of ideal gas mixtures
(Offered 1968-69, Winter Quarter)

2.903 Advanced Thermodynamics

Prep. Admission to
Engineering Graduate Program

This course, offered to day students, embodies the material in 2.901 and 2.902, Advanced Thermodynamics.

4 Q.H. credits.

(Offered 1968-69, Fall Quarter)

2.904 Special Topics in Advanced Thermodynamics

Prep. 2.902,

Advanced Thermodynamics

Selected subjects of current interest in general thermodynamics, including: chemical reactions; the law of stable equilibrium, normal and special systems and the third law. Detailed analysis of the statistics of ensembles is also covered to emphasize the relationship between thermodynamics and statistical mechanics.

(Offered 1968-69, Spring Quarter)

2.905 Cryogenic Engineering

Prep. Admission to

Engineering Graduate Program

Designed to provide a familiarity with the general field of cryogenics, some of the principal uses of cryogenics, and the ways of obtaining and preserving an environment at a low temperature. Refrigeration, cycle analysis, heat exchanger design, insulation systems, properties of materials, instrumentation problems and applications will be discussed and studied. Problems will be assigned typical of those which are encountered in the field and laboratory.

(Offered 1968-69, Fall Quarter)

2.906 Cryogenic Engineering

Prep. 2.905, Cryogenic Engineering

Continuation of 2.905 — Cryogenic Engineering.

(Offered 1968-69, Winter Quarter)

2.910 Heat Transfer

Prep. Elements of Heat Transfer

Basic laws of heat transfer; steady state heat conduction, systems with heat sources, transient heat conduction; graphical, numerical and analogical methods; thermal radiation, radiation combined with convection and conduction, radiation from gases.

(Offered 1968-69, Fall and Winter Quarters)

2.911 Heat Transfer

Prep. 2.910, Heat Transfer

Fundamentals of convection; dimensional analysis; Reynolds, Prandtl and Nusselt numbers; Reynolds analogy; elements of boundary layer theory; free convection, forced convection, boiling and condensation, heat transfer in high speed flow; heat exchangers.

(Offered 1968-69, all quarters)

2.912 Heat Transfer

Prep. Admission to the Engineering

Graduate Program

This course, offered to day students, embodies the material in 2.910 and 2.911, Heat Transfer.

4 Q.H. credits.

(Offered 1968-69, Spring Quarter)

2.920 Direct Energy Conversion

Prep. Admission to

Engineering Graduate Program

The fundamental processes of direct energy conversion and their application to the design and operation of magneto hydrodynamic power generators, thermionic converters, fuel cells, and thermoelectric converters.

(Offered 1968-69, Fall Quarter)

2.921 Direct Energy Conversion

Prep. 2.920, Direct Energy Conversion

Continuation of 2.920.

(Offered 1968-69, Winter Quarter)

2.922 Direct Energy Conversion

Prep. Admission to the
Engineering Graduate Program

This course, offered to day students, embodies the material in 2.920 and 2.921, Direct Energy Conversion.

4 Q.H. credits.

(Offered 1968-69, Winter Quarter)

2.923 Special Topics in Direct Energy Conversion

Prep. 2.921 or 2.922
Direct Energy Conversion

Irreversible thermodynamics. Unified theory of energy conversion.

(Offered 1968-69, Spring Quarter)

2.924 Thermodynamics of Propulsion

Prep. Admission to
Engineering Graduate Program

Application of the physical principles of thermodynamics, fluid mechanics, and plasmas to the prediction of the behavior of propulsion devices. The fundamentals of mechanics and thermodynamics of fluid flow, boundary layer mechanics, and heat transfer are reviewed. Air-breathing engines and rocket engines are discussed in detail with emphasis on realistic applications to demonstrate how physical laws both describe and limit the performance of particular devices. An introduction to plasmas. The fundamentals of electrical rocket propulsion.

(Offered 1969-70, Fall Quarter)

2.925 Thermodynamics of Propulsion

Prep. 2.924, Thermodynamics
of Propulsion

Continuation of 2.924, Thermodynamics of Propulsion.

(Offered 1969-70, Winter Quarter)

2.926 Thermodynamics of Propulsion

Prep. Admission to
Engineering Graduate Program

This course, offered to day students, embodies the material in 2.924 and 2.925, Thermodynamics of Propulsion.

4 Q.H. credits.

(Not offered 1968-1969)

2.927 Fundamentals of Combustion

Prep. 2.925 or 2.926,
Thermodynamics of Propulsion

An introduction to the science of combustion. The fundamentals of gas reaction, combustion in pre-mixed gases, combustion without pre-mixing, and heat and mass transfer with chemical reactions are included.

(Offered 1969-70, Spring Quarter)

2.930 Pumps

Prep. Hydraulics

Deals mainly with centrifugal pumps, with brief references to other types; flow of fluids in pipes and conduits, system curves, pump head velocity diagrams and head development, efficiency; specific speed, net positive suction head, cavitation; affinity laws, selection of pumps to suit various operating conditions and methods of driving, parallel operation; automatic operation, types of construction and materials used, methods of priming centrifugal pumps, pumping of chemicals, oils, and sludges, special problems of pump installation and operation, water hammer in pump discharge lines.

(Offered 1969-70, Winter Quarter)

2.931 Fans and Blowers

Prep. Thermodynamics

Flow of air in pipes and ducts, fan characteristics and laws, various types of

fan wheels, inlet and outlet connections, fan capacity control, fan selection and testing. Compression of air and gases, flow in pipes, head on blowers, performance curves, effect of changes in speed and inlet conditions, construction, regulation, selection, installation, and testing. Axial flow fans and blowers. Positive pressure blowers. (Offered 1969-70, Spring Quarter)

2.935 Power Plant Economics and Design Prep. Thermodynamics
An integrated study into the economic and design considerations for both isolated and central station systems. (Offered 1968-69, Fall Quarter)

2.936 Power Plant Economics and Design Prep. 2.935, Power Plant Economics and Design
Continuation of 2.935, Power Plant Economics and Design. (Offered 1968-69, Winter Quarter)

2.937 Power Plant Economics and Design Prep. Thermodynamics
This course, offered to day students, embodies the material in 2.935, and 2.936, Power Plant Economics and Design. (Not offered 1968-69)
4 Q.H. credits.

2.940 Special Topics Flow of Bulk Solids I Prep. Admission to Graduate School
Theory of Bulk Solids Flow; stress, strain and strain rates; yield locus and effective yield locus in steady flow; discussion of differential equations and their relation to plasticity and soil mechanics. Gravity flow stress and velocity fields. Radial stress derivation; stress fields in converging channels. (Offered 1968-69, Fall Quarter)

2.941 Special Topics Flow of Bulk Solids II Prep. 2.940, Flow of Bulk Solids I
Gravity flow in bins and hoppers. Designing bins and hoppers. Modeling and scale up of bin flow. Pressures acting on bin walls; transient effects; initial pressures and those during flow. Forced flow of bulk solids; theory with applications to rolling of bulk solids. (Offered 1968-69, Winter Quarter)

2.945 Special Topics Computer Methods for Mechanical Systems Prep. Admission to Graduate School
Finite difference approximations. Analysis of errors in finite difference approximations. Generation of higher order finite difference equations. Applications to plates, strings and membranes. Two point boundary value problems. Analysis of propagation problems including Euler and Punge Kutta methods and method of characteristics. Stability of difference schemes. (Offered 1968-69, Fall Quarter)
4 Q.H. credits.

2.950 Physical Metallurgy I Prep. Undergraduate Physical Metallurgy
Atomic structure and bonding. Atomic basis for elasticity. Anisotropic elastic behavior. Anelastic behavior. Equilibrium and non-equilibrium studies of 1, 2, and 3 component systems. (Offered 1968-69, Fall Quarter)

2.951 Physical Metallurgy II Prep. 2.950, Physical Metallurgy I
Oxidation; corrosion; electrical and magnetic behavior. (Offered 1968-69, Winter Quarter)

2.952 Physical Metallurgy III Prep. 2.232 or 2.951, Physical Metallurgy II
Theory of solid-solutions and intermetallic compounds; theory of phase transformations in solids; nucleation and growth; pearlitic and martensitic transformations.
(Offered 1968-69, Spring Quarter)

2.953 Advanced Physical Metallurgy I Prep. 2.232 or 2.951, Physical Metallurgy II
Point defects; theory of diffusion equations, self-diffusion, and effect of concentration gradients. Application of above topics to annealing processes.
(Offered 1968-69, Fall Quarter)

2.954 Advanced Physical Metallurgy II Prep. 2.953, Advanced Physical Metallurgy I
Dislocation theory; including such topics as dislocation stress fields, self energy, velocity, interactions mechanisms, image forces and theories of yielding.
(Offered 1968-69, Winter Quarter)

2.955 Advanced Physical Metallurgy A Prep. 2.232 or 2.951, Physical Metallurgy II
This course, offered to day students, embodies the material in 2.953 and 2.954, Advanced Physical Metallurgy I and II.
4 Q.H. credits. (Offered 1968-69, Winter Quarter)

2.956 Advanced Physical Metallurgy III Prep. 2.954, Advanced Physical Metallurgy II
Mechanical behavior of metals. Application of dislocation theory to microplasticity, strain hardening, strengthening mechanisms and creep.
(Offered 1968-69, Spring Quarter)

2.957 Advanced Physical Metallurgy B Prep. 2.232 or 2.951, Physical Metallurgy II
This course offered to day students, embodies the material in 2.954 and 2.956, Advanced Metallurgy II and III.
4 Q.H. credits. (Offered 1968-69, Spring Quarter)

2.960 Thermodynamics of Materials I Prep. Engineering Materials
Basic metallurgical thermodynamics encompassing first, second, and third laws, entropy, enthalpy and free energy.
(Offered 1968-69, Fall Quarter)

2.961 Thermodynamics of Materials II Prep. 2.960, Thermodynamics of Materials I
Continuation of 2.960 with emphasis on solutions, activity, activity coefficients, the phase rule and applications to some metallurgical problems.
(Offered 1968-69, Winter Quarter)

2.962 Thermodynamics of Materials Prep. Engineering Materials
This course, offered to day students, embodies the course content offered in 2.960. Thermodynamics of Materials I and 2.961, Thermodynamics of Materials II.
4 Q.H. credits. (Not offered 1968-69)

2.963 Thermodynamics of Materials III

Prep. 2.960 or 2.961 or
2.962, Thermodynamics of Materials

The application of metallurgical thermodynamics to various process metallurgical problems, i.e., gas-solid systems, etc., plus kinetics of reactions and dynamics systems analysis.
(Offered 1968-69, Spring Quarter)

2.965 Physical Ceramics

Prep. 2.232 or 2.951, or Physical
Chemistry or Solid State Physics

Introduction to ceramic fabrication processes. Characteristic of vitreous and crystalline solids, structural imperfections, and atomic mobility. Phase equilibria, nucleation, crystal growth, solid-state reactions, non-equilibrium phases, and effects on the resulting microstructure of ceramics.

(Offered 1968-69, Fall Quarter)

2.966 Physical Ceramics

Prep. 2.965, Physical Ceramics

Discussion of effects of composition and microstructure on the thermal, mechanical, optical, electrical, and magnetic properties of ceramic materials.

(Offered 1968-69, Winter Quarter)

2.967 Physical Ceramics

Prep. 2.232 or Physical Chemistry
or Solid State Engineering

This course, offered to day students, embodies the material in 2.965 and 2.966, Physical Ceramics.

4 Q.H. credits.

(Not offered 1968-69)

2.970 Material Science and Engineering

Prep. 2.232 or 2.951,
Physical Metallurgy II

Principles underlying the structure and properties of solid materials. The relationships of these principles to the properties and to applications in structures and devices. Both macroscopic-phenomenological and electronic-molecular approaches will be used. Materials will include metals and alloys, semiconductors, and dielectrics. Typical subjects are atomic and electronic structures, ordering, nucleation and crystal growth, bonding.

(Offered 1968-69, Fall Quarter)

2.971 Material Science and Engineering

Prep. 2.970, Material Science
and Engineering

Continuation of 2.970 into additional topics such as thermal, electric, magnetic, and optical properties; applications of solid-state phenomena to achieve functions embodied in transducers, filters, amplifiers, energy converters, and so forth.

(Offered 1968-69, Winter Quarter)

2.972 Material Science and Engineering

Prep. 2.232 or equivalent

This course, offered to day students, embodies the material in 2.970 and 2.971, Material Science and Engineering.

4 Q.H. credits.

(Not offered 1968-69)

2.974 Material Science and Engineering — Special Topics

Prep. 2.971,
Material Science and Engineering

Subjects will vary from year to year but may include mechanisms of strengthening, composite materials, application of computers to solving metallurgical problems, and thin films.

(Offered 1968-69, Spring Quarter)

- 2.975 Principles of X-Ray Diffraction** Prep. 2.232 or 2.950, Physical Metallurgy I or equivalent
General properties of x-rays. X-Ray production and detection. Emission and absorption. Introduction to diffraction and factors influencing the intensities. Analysis of diffraction patterns. (Offered 1969-70, Fall Quarter)
- 2.976 Applications of X-Ray Diffraction** Prep. 2.975, Principles of X-Ray Diffraction
Experimental methods. Applications, including: single crystal orientation, crystallite size measurement, preferred orientation, residual stresses, precision lattice-parameter measurement, phase-diagram determination, chemical analysis. (Offered 1969-70, Winter Quarter)
- 2.985 Powder Metallurgy** Prep. 2.232 or equivalent
Powder characteristics and methods of manufacture. Powder pressing: packing, interparticle bonding, effects of pressure. Principles of sintering. Characteristics and properties of products made from powdered materials. (Offered 1968-69, Spring Quarter)
- 2.990 Mechanical Engineering Seminar** Prep. Admission to Master of Science Program
Discussions by industrial leaders, faculty, and graduate students on various subjects. Open to day students only. (Offered yearly, Winter and Spring Quarters)
- 2.991 Thesis (Master's Degree)** Prep. Admission to Master of Science Program
Analytical and/or experimental work conducted under the auspices of the Department. Open to day students only. (Offered yearly, all quarters)
- 2.992 Special Problems in Mechanical Engineering** Prep. Consent of Department Chairman
Theoretical or experimental work under individual faculty supervision. (Offered yearly, all quarters)
- 2.994 Doctoral Reading** Prep. Passing of Ph.D. Qualifying Exam
Material approved by the candidate's advisor (only S or F grades will be assigned for this course). (Offered yearly, all quarters)
- 2.995 Thesis (Ph.D. Degree)** Prep. Admission to the Doctoral Program in Mechanical Engineering
Theoretical and experimental work conducted under the supervision of the department. Open to day students only. (Offered yearly, all quarters)

Mathematics

DESCRIPTION OF COURSES

The following courses are primarily for students in the engineering programs. All courses carry two quarter hours of credit unless otherwise specified. Courses carrying three or four quarter hours of credits are offered in the day only.

10.801 Advanced Mathematics Prep. Differential Equations
Series solution of differential equations: Legendre and Bessel functions; Laplace transforms; scalar and vector fields; gradient, divergence, and curl.
(Offered yearly, every quarter)

10.802 Advanced Mathematics Prep. 10.801, Advanced Mathematics
or Equivalent
Fourier series and integrals, orthogonal functions, boundary-value problems involving partial differential equations: wave equation, heat flow, Laplace equation.
(Offered yearly, every quarter)

10.803 Advanced Mathematics Prep. Differential Equations
Legendre and Bessel functions, Laplace transforms, Fourier integrals, boundary-value problems, introduction to matrix algebra.
Credits: 4 quarter hours. (Offered yearly, Fall and Winter Quarters)

10.804 Advanced Mathematics Prep. 10.802, Advanced Mathematics
Matrix algebra, determinants, inversion of matrices, rank and equivalence, linear equations and linear dependence, vector spaces and linear transformations.
(Offered yearly every quarter)

10.805 Advanced Mathematics Prep. 10.804, Advanced Mathematics
Further topics in matrices and vector spaces. (Offered yearly every quarter)

10.806 Advanced Mathematics Prep. Differential Equations
This course, offered to day students, embodies the material in 10.804 and 10.805, Advanced Mathematics.
Credits: 4 quarter hours. (Offered yearly, Fall and Winter Quarters)

10.821 Advanced Calculus Prep. Differential and Integral Calculus
Functions of one independent variable; limits, continuity, differentiability. Properties of continuous functions on a closed bounded interval. Rolle's theorem and the mean-value theorem.
(Offered yearly, Fall Quarter)

10.822 Advanced Calculus Prep. 10.821, Advanced Calculus
 Functions of several independent variables. Distance and open sets; limits, continuity. Properties of continuous functions on a closed bounded set. Differentiability and differentials, mean-value theorem, implicit function theorems, Jacobians and transformations. (Offered yearly, Winter Quarter)

10.823 Advanced Calculus Prep. 10.822, Advanced Calculus
 Sequences, sequences of functions, uniform convergence, series. Integration, line and surface integrals. (Offered yearly, Spring Quarter)

10.831 Probability Prep. Differential and Integral Calculus
 Fundamentals of probability theory; discrete and continuous probability distributions, including binomial, Poisson, and normal; law of large numbers and central limit theorem. (Offered yearly, every quarter)

10.832 Probability Prep. 10.831, Probability
 Further study of probability distributions for one or more random variables. Special topics such as occupancy problems and Markov chains. (Offered yearly, every quarter)

10.834 Mathematical Statistics Prep. 10.831, Probability or
 Equivalent
 Fundamental statistical methods. Tests of significance and estimation based on large or small samples; simple correlation and linear regression. (Offered yearly, Fall and Winter Quarters)

10.835 Mathematics Statistics Prep. 10.834, Mathematical Statistics
 Analysis of variance; further topics in statistical inference. (Offered yearly, Winter and Spring Quarters)

10.836 Mathematical Statistics Prep. 10.831, Probability or
 Equivalent
 This course, offered to day students, embodies the material in 10.834 and 10.835, Mathematical Statistics. (Offered yearly, Spring Quarter)
 Credits: 4 quarter hours.

For additional courses in Mathematics, refer to the current bulletin of the Graduate School of Arts and Sciences.

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NORTHEASTERN UNIVERSITY

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College of Business Administration

College of Criminal Justice

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College of Engineering

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Offering part-time curricula during late afternoon and evening hours leading to associate and baccalaureate degrees

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Graduate School of Education

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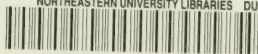
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